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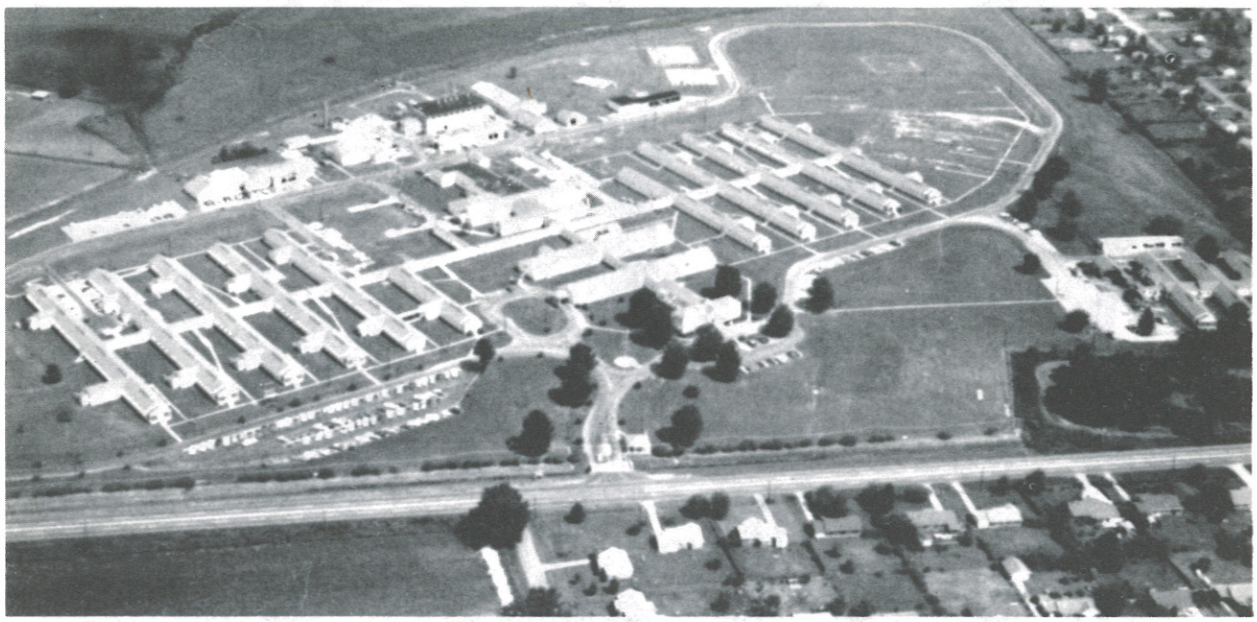

CONTENTS

NAVY SURGEON GENERAL ARRIVES BY HELICOPTER AT DA NANG AIR STRIP. Rear Admiral Robert B. Brown MC USN, arrives by helicopter at East Da Nang in Viet Nam, during his visit to medical facilities in the Far East. Pictured are (left to right) Commander R. E. Anderson, Civil Engineer Corps, U. S. Navy, the Commanding Officer of Military Construction Battalion NINE, now constructing a 400-bed hospital at Da Nang; Admiral Brown; Captain Bruce L. Canaga Jr., Medical Corps, U. S. Navy, Medical Officer of the Station Hospital at Da Nang; and Rear Admiral Walter Welham, Medical Corps, U. S. Navy, Fleet Medical Officer, Pacific Fleet. During his tour Admiral Brown traveled over 27,000 air miles, made stops at San Francisco, Hawaii, Guam, and seven other countries, and inspected 51 medical and dental facilities.

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Policy

The U.S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

Change of Address

Please forward changes of address for the News Letter to: Editor, Code 18 Bureau of Medicine and Surgery, Department of The Navy, 2300 E St. N.W., Washington, D.C. 20390, giving full name, rank, corps, and old and new addresses.

FRONT COVER: U.S. NAVAL HOSPITAL, MEMPHIS, TENNESSEE. During World War I an Army Training Field known as "Park Field" was located on part of the site of the present Naval Air Technical Training Center. None of the buildings remained at the time construction began in this area.

The property survey for the present Hospital site was made on 30 June 1942 by Mr. Sam W. McClaskey, County Surveyor of Shelby County, Tennessee. The site was purchased by taking 42.6 acres from James P. Reynolds and 163.92 acres from H. S. Mitchell. Ground was broken and the actual construction of the Hospital began on 6 August 1942. During this time, the construction of the Naval Air Station and Naval Air Technical Training Center was progressing and near completion. The former was commissioned on 15 September 1942 and the latter on 27 September 1942.

CAPT. E. L. McDermott MC USN, arrived in Memphis, Tennessee on 2 August 1942 as the first Medical Officer in Command. The supervision of construction was under his direction. Appropriate commissioning ceremonies were held on 17 March 1943.

Prior to the actual commissioning due to a large sick list at Naval Air Technical Training Center with catarrhal fever and acute rheumatic fever the Hospital wards were opened for the care of patients. On the day of commissioning, there was a patient census of 350.

A beautification program was started in March 1948 when an approved contract was let for the planting of 763 trees and shrubs at various sites on the reservation. The trees were placed along the north and west boundary and in isolated groups, about the Hospital buildings and slopes.

The issuance of this publication approved by the Secretary of the Navy on 4 May 1964.

SPECIAL ARTICLES

TYPES OF WOUNDS AND INJURIES

LCDR J. S. Cox, MC USN.*

This is the second in a series of three medical articles being presented for publication in the U.S. Navy Medical News Letter by CAPT R. H. Brown MC USN, LCDR J. S. Cox MC USN, and LCDR S. D. Harman MC USN—on the subject of wounds and injuries. It is hoped that other medical articles may be received from other Navy Medical Department officers in the various specialties on subjects of timely interest.

Missiles

Missile wounds are the most frequent injuries encountered by military surgeons. Therefore, it is essential that we possess fundamental information about types of weapons being used and the types of wounds expected from these weapons. It is important to identify the weapons which cause these missile wounds for two reasons. The first is medical, as a doctor must know the type of weapon in order to diagnose the injury correctly and treat it properly. The second is tactical, because the effectiveness of weapons is gauged by the nature of wounds produced and mortality from the injuries. During the Korean War, 90 per cent of casualties were able to identify the weapons which caused their wounds. Also of interest is the fact that in many campaigns a high percentage of wounds in our personnel may be caused by our own weapons through errors and accidents, and further information is obtained in regard to their effectiveness in this dubious manner.

Types of Missiles

a. Primary: Original projectile such as knife, bayonet, bullet, bomb fragment, mortar shell, hand grenade, mines, artillery shells, etc.

b. Secondary missiles: A missile set in motion by a primary missile.

(1) Those that travel through the air for appreciable distance before wounding, such as sand, gravel, rocks, trees, glass, bricks, etc.

(2) Those close to the body such as body armor fragments, helmet fragments and pieces of clothing.

(3) Those produced in the body such as fragments of bone or other tissue.

Ballistic Characteristics of Wounding Agents

This is extremely important in understanding wounds caused by missiles. Frequently the military surgeon has seen small entrance and exit holes in the skin of a gunshot casualty and taken it for granted that the internal damage was correspondingly small. If the surgeon had known more of the modern high-velocity rifle bullet and what is known as "yaw," the trivial external wounds would not have misled him in the initial treatment of the wound.

a. Missile velocity: This is the only common factor to all missiles and is the most important single factor in consideration of the missile as a casualty producing agent. The impact velocity is the velocity of the missile on contact with the human body and it determines the degree of casualty produced. Research has demonstrated that a missile velocity of 125–170 feet per second is necessary to effect penetration of the human skin when using steel plate 1/16 inch in diameter. In practice, most battlefield wounds are caused by missiles with velocities of 500 feet per second to 1,500 feet per second. For instance, World War I rifles had velocities of 2,300 feet per second, while World War II velocities were in excess of 4,000 feet per second. Land mines have velocities of 5,000 feet per second.

Low-velocity wounds are relatively cleaner and free from the so-called explosive effect. High-impact velocities result in many so-called explosive wounds with a maximum of tissue destruction.

b. Kinetic energy impacted to the body by impact of a missile is determined chiefly by the velocity, but in part by mass and size of the missile. After a mis-

* Orthopedics, U.S. Naval Hospital, NNMC, Bethesda, Md.

sile perforates the body its remaining kinetic energy is expended in wound formation.

c. Shape is important in regard to wounding characteristics and body perforations. Glass, sand, bullets, etc.

d. Yaw is the deviation of the longitudinal axis in flight and this augments the retardation of a bullet in tissue and thus increases the amount of kinetic energy entering into wound production. Much of the so-called "tumbling" effect of bullets is really yaw. Seldom do bullets really "tumble."

Low-Velocity Missiles

Wounds caused by these missiles are usually simple in that only the tissues which the object contacts are injured. An example is a knife or bayonet wound. There is no significant energy impacted to nearby tissue and damage is localized. The wounds are relatively clean and require only minimal debridement.

High-Velocity Missiles

These missiles cause an enormous amount of tissue damage. Tissues are flung away from the track of a missile in a velocity only slightly less than that of the missile itself. These tissues act as secondary missiles and may be especially damaging when bone is fragmented.

a. Permanent Cavity: As a missile tears through tissues it produces a permanent cavity along its tract as well as a temporary cavity. The permanent cavity is usually only slightly larger in diameter than the missile, but yaw may modify the shape of the permanent cavity from point to point along the tract. In low-energy missiles the tract may be smaller in diameter than the missile which produced it because of elasticity.

b. Temporary Cavity: When the missile penetrates the body severe shock waves are initiated with tremendous pressures travelling ahead of and out from the missile at the velocity of sound in tissues, approximately 4,800 feet per second. A temporary cavity is formed with a volume almost 27 times larger than that of the permanent cavity. The cavity reaches its greatest size after the missile has left the wound tract. The size of the cavity is determined by the velocity and kinetic energy of the missile rather than its size. The cavity may last only a fraction of a second before the walls collapse. The violence of the expansion disrupts tissues, ruptures blood vessels and nerves, and may fracture bones at some distance from the missile tract even without any direct contact. Nerves may be paralyzed and still show no gross evidence of damage. In muscles there may be splitting along fascial planes for great distances. Fluid-filled viscera are blown around by the operation of hydraulic forces. High-velocity missiles may pulp the brain substance and bones of the skull may be separated along suture lines as though an explosion occurred.

c. Area of Extravasation: On dissection of a missile wound tract the adjacent tissue is sanguineous, and in the case of the average rifle bullet, there is extravasated blood for an inch or more away from the tract. This is a good landmark for debridement and should be removed because hemorrhagic tissue provides an excellent media for pyogenic bacteria and the clostridia responsible for gas gangrene.

Types of Wounds

The impact of a missile may result in a single contusion or in a penetrating or perforating wound. In the penetrating wound all the kinetic energy is dissipated into the tissues. In a perforating wound the missile goes through the tissue and does not impact all the kinetic energy. The density of the tissues is important in the type of wound produced. Skin has high resistance and elasticity. Muscle is damaged severely because of its relatively high homogenous density. Tissues of varying density such as fascia or bone have higher resistance and may divert the direction of the missile. This accounts for the bizarre wound tracts in some missile injuries. The bullet may penetrate the scalp and gulea and be diverted by bone to circumvent the cranium. A bullet may enter the shoulder and exit through the buttocks simply by following fascial planes.

The wound of exit is usually larger than the wound of entry because of the ballistic peculiarities of yaw and also because of the temporary cavity and high energy ahead of the missile.

Regional Distribution of Missile Wounds

An analysis of missile wounds received in the Korean War revealed that wounds of the head, neck, thorax and abdomen accounted for approximately 48 per cent of those wounded in action, but 91 per cent of those killed in action. In extremity wounds, 52 per cent were wounded in action, but only 9 per cent were killed in action.

This distribution emphasizes the importance of protective helmets and body armor which reduces the number and severity of wounds of the head, thorax, and abdomen. Experience in Korea showed that

TABLE I

Location	Killed in Action (%)	Wounded in Action (%)
Head	41	15
Neck	5	3
Thorax	35	19
Abdomen	10	11
Upper Extremity	2	25
Lower Extremity	7	27

body armor deflected 68 per cent of all missile hits. As medical officers we should take note that with these protective devices there will be less fatal wounds and a greater number of men reaching medical facilities. Also, the proportion of wounds of the face, neck, perineum and extremities is greatly increased.

Thermal Burns

Causes: Burns from gasoline and kerosene account for 50 per cent of all burns in the military. Other causative agents are propellants such as cordite and mitrocellulose which cause flash burns, smoke producers which cause acid burns, and napalm which is a jelly of fatty acids and gasoline.

Classification: As you well know, burns are always classified in two ways according to the depth of the burn (recorded in "degrees") and according to the extent of body surface involved.

a. Depth of the burn is determined by intensity of heat and duration of exposure of tissues to heat. Burns from hot liquids or gasoline explosions are often superficial but burns caused by flame from missiles or by fire are usually deep.

b. Extent of the lesion is important because the character of local healing is determined by depth, but the survival of a casualty is determined by extent and depth. Extent is calculated by the "rule of nines." As a practical matter, a burn of more than 20 per cent of third degree burns endangers life and a third degree burn of more than 30 per cent is generally fatal to adults in the *absence* of treatment.

Cold Injuries

Military forces have not been troubled with cold injuries in Viet Nam, but in Korea, cold produced a great number of casualties and was a major problem.

Classification: Trauma produced by exposure to cold weather in order of ascending recurrences: Chilblains, trenchfoot, and immersion foot; frostbite; and total freezing.

a. Chilblains frequently affects the hands and results from exposure to temperatures above freezing, associated with high humidity.

b. Immersion foot implies an injury caused by prolonged exposure to water below 50° F.

c. Trenchfoot (which also occurs in the hands) results from prolonged exposure to cold at temperatures above freezing after in a damp environment and usually in connection with immobilization and dependency of extremities.

d. Frostbite is a cold injury which crystallizes tissue fluids in the skin or subcutaneous tissues after exposure to temperatures below freezing. Space frostbite is identical and caused by exposure at high altitudes.

Pathologic Process of Cold Injuries: The type of injury produced by cold is dependent upon the temperature at which the exposure occurs, the duration of exposure, and environmental factors which intensify the effect of temperature. Two histopathologic types of cold injury have been described. The first is due to actual freezing of the tissues and the second is due to ischemia and tissue anoxia. It is doubtful that freezing alone accounts for many lesions and some degree of tissue anoxia is probably responsible for damage in all cases.

Clinical Manifestations:

a. First degree cold injury: Hyperemia and edema are early signs. The skin becomes cyanotic and then red and dry. Swelling begins within three hours and may persist for 10 days or more. Desquamates of the superficial layers of the skin begins within 5–10 days after injury and may continue for a month.

b. Second degree cold injury: Again hyperemia and edema are early manifestations. Superficial vesicles appear within 12–24 hours of rewarming, usually on the great toe and the heel. As the vesicles dry they form black eschar. Throbbing or aching pain may be present for 3–20 days after injury.

c. Third degree cold injury involves the full skin thickness and extends into the subcutaneous tissues. Vesicles appear at the periphery of the affected area and edema of the entire foot may occur. The skin over the area forms a black, hard, dry eschar and when it desquamates there is a remaining ulcer which epithelializes. Average healing time is 68 days.

d. Fourth degree cold injury: There is destruction

of the entire thickness of the part including the bone with resultant loss of all injured tissues. Vesicles and edema are present. Injured tissues become black, dry or shriveled and may continue as a gangrene. This takes about 20 days. The line of demarcation becomes apparent after about five weeks.

Treatment: Depends on time, severity, complications and area affected.

a. Rapid rewarming.

b. Anticoagulant therapy—theoretical value but not of great practical value.

c. Sympathetic nerve interruptions by drugs, injections, surgery. This has also not been of significant benefit in therapy.

First Aid:

a. Non-ambulatory—treat as litter cases.

b. Remove constricting clothing such as boots, gloves, and socks.

c. Rewarm parts by immersion in water at 90–104° F.

d. Maintain general body warmth. Encourage sleep and rest.

e. Tetanus toxoid.

f. Prohibit smoking.

g. *No* walking, massage, exposure to open fire, cold water, soaks, or rubbing with snow.

Blast Injury

Types of blast injury:

a. *Air blast*: Injuries caused by air blast vary with the wave length. In a blast which produces short wave lengths (evidenced by a clapping, high-pitched sound) several waves will pass through the body at a given time and possibility of internal injury is greatly increased. If wave lengths are longer (evidenced by a thundering, low-pitched sound) only a single wave will pass through the body at a given time, and chances of injury are less but a viscous may be ruptured.

b. *Underwater blast*: Blast pressure in water travels much more rapidly than blast pressure in air and is effective at much greater distances. The human body has nearly the same density as water and the blast wave may go through solid tissues without displacing them. However, when the wave reaches gas-filled cavities such as the lungs and intestines the local effects may be enormously disruptive. If a person is under water at the time of blast, the injuries are usually fatal.

c. *Solid blast*: This is pressure transmitted through solid objects such as the deck of a ship, and the pressure waves may produce multiple fractures, disruption of blood vessels, or damage to internal organs without damage to the skin.

Manifestations and Diagnosis: Since blast injuries may produce no external evidence of injury these patients are often treated as victims of battle neuroses because of their confusion, nervousness, etc. Also, blast injuries may be overlooked when other more obvious injuries are present such as open wounds or fractures.

a. *Ear injuries*: Tympanic membranes may be ruptured by air blasts especially.

b. *Chest injuries*: These extremely dangerous injuries are the result of direct impact of the ribs in the lung after the chest wall has been driven inward as the result of a nearby explosion. There is damage to the chest wall with rupture of the alveoli and widespread hemorrhage into the alveoli. There may be shock, restlessness, cyanosis, rapid pulse, pain in the chest and upper abdomen, dyspnea, cough, frothy hemoptysis and diminished respiratory excursions. Later moist rales are heard. X-rays show diffuse mottling in the affected lung fields within a few hours. Management consists of rest, oxygen, tracheotomy if indicated, suction and antibiotics.

c. *Abdominal injuries*: These injuries include contusion of the viscera, retro-peritoneal hemorrhages, perforations of stomach and intestine, and serious hemorrhage from solid organs, especially the liver. Patients describe a sudden onset of pain "like a kick in the belly" and it may subside and then recur. There may be nausea, vomiting, and a desire to defecate. There later may be black stools or bloody urine. Examination reveals abdominal tenderness, muscle guarding and rigidity and signs of pneumoperitonitis. Location of pain in the abdomen is important in determining the site of trauma. Upper abdominal pain is often caused by chest trauma and can be confusing.

Multiple Injuries

Etiology: Patients may have multiple wounds from the same or different causes and there is synergestic effect of the various pathologic processes. There is increased frequency and severity of shock, and there may be conflicting priorities for initial care of the various injuries. Environmental factors and general body conditions may influence overall severity.

Diagnosis and Sorting: A thorough examination must be carried out at the battle aid station. This is difficult because the patient may be fully clothed, dirty, blood spattered, wearing splints of various types, and incoherent from shock. The medical officer must be aware of the combinations of injuries. For instance, in a mine blast causing a mangled foot there may also be severe shock from an intra-abdominal ruptured colon from the air blast. The patient is passed on from the battle aid station after initial first aid care and accurate recording of all injuries suspected or already diagnosed.

Order of Management: After all injuries have been diagnosed at the field hospital, it is necessary to determine which injuries present the greatest danger to life, which need treatment most urgently and which can be delayed. Respiratory obstruction and wounds of the chest are usually of foremost importance.

Major fractures and extravasation of urine are both patent causes of shock and can be dealt with rapidly. Intracranial and abdominal injuries require more time-consuming treatment, but, fortunately, usually produce less shock. Most important is that the simplest surgery and procedures that will save life is all that should be attempted. Unnecessary operations or those that can be deferred should not be undertaken.

HEAT STRESS IN MILITARY OPERATIONS

LT A. R. Dasler, MSC USN, Thermal Stress Section, Occupational Health Division, BuMed.

Military effectiveness afloat and ashore is very often related to heat stress. In view of the serious Medical Department problems associated with heat illnesses, a forthcoming BuMed Instruction will provide information on their differential diagnoses. This directive will further provide indicated therapy and prophylaxis. Often a correct differential diagnosis between heat exhaustion and heat stroke, and application of appropriate therapy, will determine the survival or death of a heat casualty.

Medical sciences have long recognized the serious problems of heat stress.[1-3] However, heat stress in military operations is far more stressful than in most civilian pursuits because of the demands for prolonged exposures to wider extremes of temperatures and combat situations. Furthermore, the records of recent deaths from heat stroke in recruit training clearly illustrate the disparity between civilian and military requirements.

Even though a small percentage of the total strength of the Navy and Marine Corps may become heat casualties in the clinical sense,[4] the incidence of heat illnesses have high significance. The number, classification and manner of occurrence of heat casualties serve to indicate the prevailing environmental and operational conditions detrimental to effective performance of any military unit. Therefore, the impact of heat stress can become evident in three forms: 1) loss of personnel, 2) reduced combat effectiveness of a unit, and 3) failure of a mission.

A further insight into the effects of heat stress may be obtained through the following examples cited from voluminous reports:

a) The notorious incident of 1756 known as the Black Hole of Calcutta was tragically repeated during 1956 in the Sudan.[5] 281 prisoners were locked overnight in a ward intended for 16 soldiers. The next morning 187 were found dead and 11 of the survivors were in shock. Two of the 11 died on the way to the hospital and 5 of the remaining nine died on the day of admission. Autopsies revealed the major cause of death to be *extreme dehydration* rather than heat stroke.

b) During sea trials aboard the USS DES MOINES in 1951, outside ventilation was secured to all vital spaces in order to simulate NBC warfare operational procedures.[6,7] Fifteen minutes after ventilation was secured in a machinery room space, at cruising speed where the thermal load was considerably less than at full or flank speed, three of the watch standers had to be removed because of their poor physical condition. The remainder of the crew became incapacitated and had to be removed within the next five to 15 minutes. A total of seven of the 12 man crew in the space had to be helped up the ladders and treated in the sick bay. Fortunately there were no stretcher cases.

Through the cooperative research efforts of BuMed, BuShips and support facilities for BuShips, experimental concepts have proven very successful in extending the safe exposure times for similar operational conditions in such spaces. The exposure times have been extended to nearly four hours under maximum thermal loads, versus the former 20 to 30 minutes under lower thermal loads.[8,9]

c) A U.S. Marine Corps Division conducted an amphibious combat exercise on Mindoro Island, P.I., in the spring of 1962. Approximately 75 heat casualties, including one fatal heat stroke, were encountered by the Division.

"Although the incidence rate of heat casualties in the landing force was by no means inconsequential,

the number was small compared to the estimated 300 rifle infantrymen rendered ineffective by the heat on the day the amphibious assault was launched. The effects of heat stress were particularly severe in the units which undertook a forced march of 13 miles to capture the air strip. Observers with the aggressor force state that in real combat these units would have been decimated by the well-acclimatized aggressor force which had been on Mindoro for approximately four weeks."[4]

Therefore, this example indicates that an *adequate level of acclimatization* can be a very decisive factor in combat.

Unfortunately there are rarely more than brief comments and occasional paragraphs read during one's college, university and/or service school training relative to the effects of heat stress. Appropriate Medical Department personnel must be familiar with the many thermal stress factors which adversely affect performance of operational units, because of a wide variance in individual tolerance to heat and cold. Some of the basic factors which play important roles in determining the degree of thermal stress adaptation and tolerance may be considered as: an adequate level of acclimatization and intake of water and electrolytes; body morphology, composition and nutrition; physical fitness; and appropriate clothing, indoctrination, training and leadership. It is imperative that all pertinent factors be properly integrated to achieve the maximum benefit for the individual man as well as his unit.

To give needed assistance to the Thermal Stress Section, Occupational Health Division of BuMed, it is urgently requested that the Report of Heat Casualty (Form NAVMED 1426) be carefully and accurately completed on each heat casualty. It is further urgently requested that the NAVMED 1426 forms be promptly forwarded to BuMed Code 73.

References

1. Wakefield, E. G. and Hall, W. W.: Heat Injuries. A Preparatory Study for Experimental Heat-Stroke, JAMA 89(2): 92-95, July 9, 1927.
2. Hall, W. W. and Wakefield, E. G.: A Study of Experimental Heat-Stroke, JAMA 89(3): 177-182, July 16, 1927.
3. Whayne, T. F.: History of Heat Trauma as a War Experience, Military Medicine Notes 2: Section 5. Problems of Hot and Cold Climates, Army Medical Service Graduate School, 1951.
4. Minard, D. and O'Brien, R. L.: Heat Casualties in the Navy and Marine Corps 1959-1962 with Appendices on the Field Use of the Wet Bulb-Globe Temperature Index, Naval Med Res Inst, Research Rept MR 005.01-0001.01, Rept. No. 7, 12 March 1964.
5. Haseeb, M. A. and Amin, F.: Fatal Effects of Heat on Man, Jour Trop Med Hyg 61: 280-281, Nov 1958.
6. Yaglou, C. P. and Minard, D.: Human Endurance to High Levels of Heat and Humidity, Naval Med Res Inst Research Rept Project X-205, Rept No. 9, July 9, 1952.
7. Minard, D.: Heat Stress in Navy and Marine Corps Operations, Navy Technical Forum NavExos P-2193, Spring 1961. (Declassified 1964.)
8. Dasler, A. R.: Heat Stress in Closed Fire Room Spaces, Presented at the Thirtieth Meeting of the NAS-NRC Subcommittee on Thermal Factors in Environment, Washington, D.C., 30 March 1964.
9. Dasler, A. R.: BuMed Final Report on Shipboard Toxicological Operational Protective Systems (STOPS) Phase No. 2, Evaluation During Sea Trials, Naval Med Res Inst ltr report NMRI-013-aw, 3900, Ser: 09, July 27, 1964.

MEDICAL ARTICLES

A NOTE ON FATALITY IN SERUM HEPATITIS*

Thomas C. Chalmers, MD, Raymond S. Koff, MD, and George F. Grady, MD, Gastroenterology 49(1): 22-26, July 1965. Medical Services of the Lemuel Shattuck Hospital, Tufts University School of Medicine, Boston, Mass.

In the age of remarkable medical progress, serum hepatitis continues to present a challenge to physicians. The development of complex medical and surgical techniques has resulted in an ever-increasing utilization of blood and blood products, as well as a profusion of blood chemistry studies, skin tests and immunization procedures, all sharing tissue penetration as a common denominator. Serum hepatitis has followed tissue penetrations in diabetic clinics,[1] venereal disease treatment centers,[2] and physicians' offices,[3,4] but the most common method of transmission is by transfusion of blood or blood derivatives.

During recent years an association between increased risk of death from serum hepatitis and advanced age of the patient has been recognized.[5] Of transfusion-associated hepatitis in individuals under 35 years of age, 158 cases were reported to the Hepatitis Surveillance Unit of the Communicable Disease Center between July 1963 and June 1964.[6] In this group the case fatality rate was 6%, whereas 28% of reported cases over the age of 65 died. However, the disruption of life expectancy among "young" patients may represent a disaster of even greater significance when one considers that the total number of "man years" of life lost may be as great as that resulting from a higher fatality rate in an older population.

In the absence of any method of sterilizing blood, the physician must decide whether or not an individual patient's life expectancy will be curtailed more by the occurrence of post-transfusion hepatitis than by the illness for which transfusion is contemplated. To determine this the physician needs an accurate estimate of both the occurrence rate of serum hepatitis and the potential lethality of this disease. Information on the former indicates that the risk depends in part upon the source of the transfused blood.[7] The reported case fatality rates (deaths per 100 patients contracting the disease) are extremely variable, however, and the purpose of this review is to attempt to elucidate the factors responsible for that variability.

Prior to consideration of age and health of the patients, and of virus virulence and inoculum size as probable major determinants of the variable mortality, it is necessary to consider certain characteristics of the reporting of the data. Twenty-three papers containing accurate case fatality rates are summarized in tables 1 to 3, divided according to relation to transfusions or other injections, and military or civilian populations. In each table the data are arranged according to ascending mortality. There is an inverse relationship between case fatality rate and number of patients observed (tables 1 and 2). This suggests that those observers who see and write about small numbers of cases see only the more severely ill ones. The larger series may have lower fatality rates because more mild cases are included. This is one possible explanation for lower rates in military populations where it is more likely that even the mildest cases will be hospitalized. However, it cannot be the only explanation.

An additional factor of importance, seldom considered in literature reviews, is the understandable tendency of clinicians to report unusual rather than expected phenomena. Thus, a high case fatality rate in a small sample might be directly attributed to biological or sampling variability and occur only once in every 100 or 1000 series of patients. Yet because of the interest stimulated in both author and editor it would be much more likely to appear in print than the series with more average or mundane fatality

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Address requests for reprints to: Dr. T. C. Chalmers, 170 Morton St., Boston, Mass. 02130.
The authors wish to thank Dr. Hugo Muench and Dr. James Mosley for their assistance in the preparation of the manuscript.
Dr. Koff is an Epidemic Intelligence Service Officer, Communicable Disease Center, Public Health Service assigned to the Boston Interhospital-Liver Group.

TABLE 1. *Case fatality rates of nontransfusion serum hepatitis*

Case fatality rate	No. patients	No. deaths	Year	Age of patients	Other disease	Source	Reference
%							
0.3	10,284	31	1942	U.S. military	None	Contaminated yellow fever vaccine	8
2.6	736	19	1940-41	Adults	? Nutrition	Contaminated yellow fever vaccine	9
12	100	12	1946	?Adults	Physician's practice	Contaminated syringes	3
18	226	40	1946-47	Polish military	Syphilis treatment	Contaminated syringes	2
22	18	4	1937	Children	None	Contaminated measles immune sera	10
37	41	15	1960	Adults	Psychiatrist's practice	Contaminated infusion equipment	4
43	7	3	1938	Children	Mental retardation	Contaminated measles immune sera	11

TABLE 2. *Case fatality rates of transfusion-associated serum hepatitis among the military*

Case fatality rate	No. patients	No. deaths	Year	Age of patients	Source	Reference
%						
2	103	2	1944-45	U. S. military	Blood and plasma	21
6	72	4	1943-45	U. S. military	Blood and plasma	22
19	32	6	1945	U. S. military	Blood and plasma	23
20	5	1	1943	British military	Blood and plasma	24

rates. Similarly, an unusually low fatality rate might be more likely to achieve publication than one considered "average." This is a strong force for scattering the distribution of *reported* fatality rates.

The data in table 3 further illustrate this point. Three different series of 189 to 510 patients have very similar fatality rates, 11 to 12%,[5-7] while of nine series of less than 45 patients each, four have rates of 0 to 11%, and five of 20 to 62%. If one assumes a true observed mortality rate of 12%, then rates of 2.8 to 30% may be found with 95% confidence in random samples of 25 cases. A fatality rate of 62% in a sample of eight patients could occur by chance distribution in one out of 100,000 studies of this homogeneous population. This is an unlikely happening, but with the other reports, with around 25 cases each, it is entirely possible that we are dealing with the distribution of the likelihood of reporting a series of observations on samples of a population, rather than that of the true distribution of the fatalities. The curve cannot be expected to be smoothly bell-shaped because of the tendency in the case of small samples to report the tail-end series rather than the modal one. Nevertheless, this is probably not the sole explanation for the variability, and examination of other possible factors, including age and health of the patients, and virulence and dosage of the virus, is warranted.

With regard to the latter two, little information is available from reported epidemics, and limited volunteer studies have not provided the necessary data to evaluate adequately the role of virus virulence and inoculum size as lethality determinants.

In considering age as a factor in mortality, comparisons between transfusion-associated and nontransfusion-associated serum hepatitis are of interest. In two reports in which the disease was transmitted by contaminated syringes or infusion equipment, case fatality rates of 12 and 37% among adult patients have been reported in epidemics traced to physicians' offices.[3,4] A similar outbreak in military personnel, a notably younger age group, receiving venereal disease treatment with contaminated equipment resulted in 18% fatality in afflicted patients.[2] However, in contrast, only 0.3% of military personnel died after contracting hepatitis following yellow fever vaccine inoculation during the Second World War.[8] Al-

TABLE 3. *Case fatality rates of transfusion-associated serum hepatitis among civilians*

Case fatality rate	No. patients	No. deaths	Year	Age of patients	Source	Reference
%						
0	22	0	1945-48	All ages	Blood alone	12
4	22	1	1950-51	Adults	Blood and human thrombin	13
6	112	7	1945-48	All ages	Blood and plasma	12
7	44	3	1943-56	? Adults	Blood and plasma	14
11	15	2	1950-51	? Adults	Blood and human thrombin	15
11	189	21	1946-56	All ages	Blood and plasma	5
12	257	32	1951-62	All ages	Blood and plasma	7
12	510	59	1963-64	All ages	Blood, plasma, and fibrinogen	6
20	15	3	1942-47	Adults	Blood and plasma	16
28	40	11	1937-48	? All ages	Blood and plasma	17
36	25	9	1944-49	All ages	Blood, plasma, and anthihemophiliac extract*	18
36	11	4	1945	Adults	Blood and plasma	19
62	8	5	1947-48	Infants, children	Blood and plasma	20

* One patient received antihemophiliac extract in addition to blood.

though this markedly lower death rate might reflect the small size of the inoculum, it is possible that the agent was relatively avirulent. That this may also represent an age-related effect is suggested by the fact that adult civilians (some of whom may have been in a poor nutritional state) receiving yellow fever vaccine during the same period had a case fatality rate eight times that of their younger, military counterparts.[9] The difficulties of relating age to mortality are confounded by the high case fatality rates of 22 and 43% among British children inoculated with contaminated measles immune sera during the late 1930s.[10,11] An agent of remarkable virulence must be invoked if the small number upon which the fatality rate is based, is truly representative of the population affected.

The literature pertaining to post-transfusion viral hepatitis is only somewhat less confused, due in part to the difficulty of disentangling the effects of selection for reporting and the contribution of advanced age, chronic illness, and the presence of malignancy. Case fatality rates between 0 and 62% have been reported from large hospitals when hepatitis was associated with transfusion of blood or blood derivatives.[5-7,12-20] The latter figure,[20] the highest found in this review, is all the more fascinating because it was reported in infants and young children. The small number involved in this report is similar to that in the British children receiving contaminated measles immune sera, again raising the question of selection of patients as a determinant of the lethality. The hospitalized sample of afflicted children may be smaller and proportionately sicker than adults.

The general health of the patient prior to onset of serum hepatitis would also seem to affect the immediate outcome of this disease. Debility accompanying chronic disease and malignancy may be a significant factor in the high mortality of post-transfusion hepatitis. A good example of this is to be found in the Boston study. When patients with malignancy were excluded from this series, the case fatality rate decreased from 12 to 9%.[7] However, 28% of patients with post-transfusion hepatitis and malignancy died.

Summary

The marked variability in the reported case fatality rates in serum hepatitis would seem to have at least four explanations:

1. Variations in selection of patients comprising the population studied. The inclusion of fewer patients with mild illness must result in a higher case fatality rate.

2. Tendency of physicians to report the unusual. This may be responsible for the incongruity of the distribution curves of papers published and fatality rates encountered.

3. Differences in virulence, or dose of the virus, or both.

4. Susceptibility differences, including age, debility from disease, and other now unknown host factors.

References

1. Sherwood, P. 1953. An outbreak of syringe-transmitted hepatitis with jaundice in hospitalized diabetic patients. Ann Intern Med 33: 380.
2. Borensztejn, H. 1948. Homologous serum hepatitis: review of 216 cases. Lancet 1: 941.
3. Dull, H. B. 1961. Syringe-transmitted hepatitis: a recent epidemic in historical perspective. JAMA 176: 413.
4. Dougherty, W. J., and R. Altman. 1963. A physician-related outbreak of hepatitis. Amer J Public Health 53: 1618.
5. Allen, J. G., and W. Sayman. 1962. Serum hepatitis from transfusion of blood. JAMA 180: 1079.
6. Mosley, J. W. The surveillance of post-transfusional viral hepatitis. Presented at the 1964 conference on post-transfusion hepatitis, University of Cincinnati Medical Center, Cincinnati, Ohio.
7. Grady, G. F., T. C. Chalmers, and the Boston Inter-Hospital Liver Group. 1964. Risk of post-transfusion viral hepatitis. New Engl J Med 271: 337.
8. Sawyer, W. A., K. F. Meyer, M. D. Eaton, J. H. Bauer, P. Putnam, and F. F. Schwentker. 1944. Jaundice in army personnel in the western region of the United States and its relation to vaccination against yellow fever (Part I). Amer J Hyg 39: 337.
9. Fox, J. P., C. Manso, H. A. Penna, and M. Para. 1942. Observations on the occurrence of icterus in Brazil following vaccination against yellow fever. Amer J. Hyg 36: 68.
10. Memorandum by Medical Officers of the Ministry of Health. 1943. Homologous serum jaundice. Lancet 1: 83.
11. Propert, S. A. 1938. Hepatitis after prophylactic serum. Brit Med J 2: 677.
12. Lehane, D., C. M. S. Kwantes, M. G. Upward, and D. R. Thomson. 1949. Homologous serum jaundice. Brit Med J 2: 572.
13. Lesses, M. F., and M. W. Homolsky. 1951. Epidemic of homologous serum hepatitis apparently caused by human thrombin. JAMA 147: 727.
14. Strumia, M. M., M. E. Burns, A. B. Sample, and J. J. McGraw. 1958. The incidence of post-transfusion hepatitis. II. A 13-year survey including 2 years during which blood donors were screened by means of liver function studies. Amer J Clin Path 30: 133.
15. Porter, J. E., M. Shapiro, C. L. Maltby, M. E. Drake, J. A. Barondess, W. J. M. Bashe, J. Stokes, Jr., J. W Oliphant, W. C. L. Diefenbach, R. Murray, and N. C. Leone. 1953. Human thrombin as vehicle of infection in homologous serum hepatitis. JAMA 153: 17.
16. Robinson, J. W., D. N. Twaddell, and W. P. Havens, Jr. 1950. Homologous serum hepatitis. Ann Intern Med 32: 1019.
17. Ratnoff, O. D., and G. S. Mirick. 1949. Acute hepatitis in general hospital practice. Bull Johns Hopkins Hosp 85: 299.
18. Steele, H. H. 1950. Mortality in homologous serum hepatitis. Ann Intern Med 15: 59.
19. Scheinberg, I. H., R. D. Kinney, and C. A. Janeway. 1947. Homologous serum jaundice. A problem in the operation of blood banks. JAMA 134: 841.
20. Moloshok, R. E., S. Karelitz, and L. Strauss. 1949. Homologous serum hepatitis in infants and children. Pediatrics 3: 651.
21. Grossman, E. B., S. G. Stewart, and J. Stokes, Jr. 1945. Post-transfusion hepatitis in battle casualties and a study of its prophylaxis by means of human immune serum globulin. JAMA 129: 991.
22. Berk, E. J. 1947. Hepatitis following transfusion. Gastroenterology 8: 296.
23. Snell, A. M., D. A. Wood, and L. J. Meienberg. 1945. Infectious hepatitis with special reference to its occurrence in wounded men. Gastroenterology 5: 214.
24. Steiner, R. E. 1944. Five cases of jaundice following transfusion of whole blood or human plasma. Brit Med J 1: 110.

DIAGNOSIS AND MANAGEMENT OF ACUTE PANCREATITIS

George L. Nardi MD, Massachusetts General Hospital, Boston.*

Postgraduate Medicine 37(5): 500, May 1965.

Acute pancreatitis is a metabolic clinical syndrome characterized by sudden onset of steady upper abdominal pain. It may be associated with nausea and vomiting, fever, tachycardia and syncope. The disease may be of short duration and self-limiting or persistent and progressive. It is most frequently associated with alcoholism, gallstones or gastronomic excess. The diagnosis is usually confirmed by an elevated serum amylase.[1]

Cause and Symptoms

Fitz[2] first defined pancreatitis as a clinical entity in 1889. Since that time most investigators have felt that the clinical manifestations and complications of this disease are in some way due to the uncontrolled and self-destructive action of the pancreatic enzymes. The normal exocrine pancreas synthesizes and secretes its protein enzymes in the form of zymogens, i.e., inactive precursors, which are activated in the gastrointestinal tract. In pancreatitis, it is believed that some or all of these enzymes may be activated prematurely within the gland to set up a chain of self-perpetuating biochemical reactions which may eventually result in its destruction and the death of the host.

In the laboratory this sequence of events may be initiated by a wide variety of technics. However, in man, it is likely that the combination of an obstructive process and an actively secreting gland is the causative mechanism. The obstructive process may be one of many possible entities, from the mucosal edema associated with peptic ulcer to a carcinoma of the head of the pancreas. There is good evidence that partial or intermittent obstruction to pancreatic secretion may be more hazardous than a complete block. In some cases this obstruction may occur as a metabolic block at the cell membrane,[3] but in this situation the symptoms are milder and more prolonged and the symptom complex is better classified as chronic rather than as acute pancreatitis.

The presenting symptom of acute pancreatitis is severe, steady epigastric pain which may or may not radiate through to the back. The severity of the pain frequently corresponds to the gravity of the disease. Nausea and vomiting are often but not necessarily present. The history may reveal one or more previous episodes of a similar character or, not infrequently, a cholecystectomy which did not relieve precholecystectomy symptoms. An alcoholic spree or dietary debauch, or both, may have precipitated the presenting attack. The disease may appear at any age and there is no preference for either sex.

* Associate Clinical Professor of Surgery, Harvard Medical School; Associate Visiting Surgeon, Massachusetts General Hospital, Boston.

The physical findings in acute pancreatitis are variable and inconsistent. Generally some degree of epigastric tenderness and guarding is present. Rigidity is rare. A mass representing the swollen and edematous pancreas may frequently be palpated. Abdominal distention secondary to ileus often appears. The pulse is often elevated but hypotension is rare. Some degree of jaundice may be noted, which may be hepatocellular or due to compression of the common bile duct by the swollen head of the pancreas.

Diagnosis

The most valuable single laboratory test is the serum amylase level, which is almost uniformly elevated early in the course of the disease; it frequently may fall to normal levels within 24 hours of the onset of symptoms. In some cases there may be no detectable elevation. There is no correlation between the level of serum amylase and the severity of the disease. The urinary amylase is also of value.[4]

Serum lipase elevations are also useful, but the technics are more complicated and time-consuming and less sensitive. In addition, serum lipase is less frequently elevated than serum amylase; hence, this determination is not often done. Nevertheless, serum lipase may become elevated later in the disease, when amylase levels have fallen, and may be of particular diagnostic value in this situation.

Serum calcium has been used as an index of the severity of the acute process. In general, values of 7.0 gm per cent or less have augured a poor prognosis and have been associated with a high mortality. Elevations of the serum calcium should suggest the possibility of hyperparathyroidism as the cause of the pancreatitis.[5] Normal values for serum calcium in a clinically severe attack with high levels of serum lipase warrant further checks, for the acute process may have lowered the hypercalcemia of hyperparathyroidism to normal levels.

X-rays of the abdomen are usually done to rule out other acute pathologic disorders and may occasionally demonstrate the "sentinel loop" of distended small bowel in the left upper quadrant, an epigastric soft-tissue mass, or haziness typical of intra-abdominal fluid.

Although the physician is usually aware of the diagnosis in acute situations, it is surprising how infrequently he considers it as a secondary diagnosis, i.e., as a postoperative complication. Postoperative pancreatitis is a frequently unrecognized complication after gastric or biliary tract surgery. It may, however, occur after any major operation. Because it occurs at a time when the patient may not be coherent or may be narcotized and when other causes of fever, tachycardia and abdominal pain are more obvious, it is not diagnosed as early or as often as it should be. The recognized cases carry an alarming mortality—in excess of 50 per cent![6] Postoperative pancreatitis should be suspected in any patient who is not progressing as he should after biliary or gastroduodenal surgery and who has no demonstrable cause for his difficulties.

Treatment

The treatment of acute pancreatitis is medical and consists of symptomatic, supportive and prophylactic measures.[7]

Pain is treated with meperidine hydrochloride (Demerol® hydrochloride) rather than morphine, since the latter is believed to have a greater and more prolonged spastic effect on the ampulla and duodenum, which could affect the disease unfavorably.

Physiologically, pancreatitis represents a form of internal burn, with loss of circulating protein and electrolytes from the peritoneum. Supportive therapy in the form of fluids, electrolytes, albumin, plasma and blood should be provided appropriately. Dextran may be of value not only in combating shock but also in inhibiting pancreatic secretion. Although the serum calcium level may be below normal, tetany is an exceedingly rare complication. Supplemental calcium is usually unnecessary and has little influence on the depressed serum level. Antibiotics are probably used more often than not and may be of value in preventing suppurative complications; however, there is little to suggest that they have any influence on the course of the disease. The same comments apply to the use of steroids.

Prophylactically, every effort is made to reduce or eliminate pancreatic stimuli. Nasogastric suction not only may benefit ileus but may also reduce the acid stimulus to the pancreatic secretagogues secretin and pancreozymin, elaborated by the mucosa of the antrum and duodenum. Anticholinergics such as atropine and methantheline bromide (Banthine® bromide) act similarly and may reduce the vagotropic stimulus to pancreatic secretion. There is some evidence that parenterally administered propylthiouracil may have a beneficial effect by inhibiting the metabolic chain of enzymatic autocatalysis.

In recent years a wave of enthusiasm has devel-

oped for an antienzyme, Trasylol, produced in Germany. This compound has been widely used in Europe and South America for the treatment of pancreatitis. It is not commercially available in the United States, but has been available for clinical and experimental testing. In my experience, this agent is dramatically beneficial in experimental pancreatitis when administered early and in large doses. Its chief value in pancreatitis may eventually lie in its prophylactic administration during and after surgery which involved manipulation and instrumentation of the pancreas, the duodenum and the common duct.

Some patients do not respond well to a conservative program. The disease may pursue a smoldering course without signs of improvement or may follow a pattern of slow deterioration. These patients, carefully selected, may benefit by surgical exploration, with transduodenal sphincteroplasty and exploration of the pancreatic duct. In the past three years we have encountered six patients in whom acute pancreatitis failed to subside and who were subjected to this type of surgery. All had rapid resolution of the disease, and no complications resulted from the operative procedure.[8]

The treatment of complications of pancreatitis is surgical. Abscesses require drainage and pseudocysts necessitate a decompression procedure.

The formation of a pancreatic pseudocyst during the defervescence of the acute process is signaled by a secondary rise or persistence of the elevated amylase level and the presence of a palpable abdominal mass. A pseudocyst is best treated by cystenterostomy to the stomach when it is adherent to the latter, and otherwise by a Roux loup of jejunum.

In some patients who have deteriorated rapidly despite all measures, total pancreatectomy has been suggested as a desperation maneuver. To my knowledge this has never been accomplished. It would seem that the magnitude, risk and sequelae of this procedure, as well as evidence in experimental animals of its ineffectiveness in reversing the lethal chain of events, will continue to discourage this bit of surgical heroism.

After subsidence of an acute attack of pancreatitis, diagnostic studies should be undertaken to rule out the presence of a precipitating disorder such as biliary tract disease, duodenal ulcer of hyperparathyroidism. Nonvisualization of the gallbladder may persist for six to eight weeks after an attack, so cholecystography should be delayed for this period. If biliary tract disease is found, corrective measures should be taken. These will not, however, guarantee freedom from further bouts of pancreatitis. There is no indication for the removal of a normally functioning gallbladder as a prophylactic measure. The patient should follow a low-fat diet, and every attempt should be made to modify excessive dietary and, in particular, alcoholic habits.

Relapsing Acute and Chronic Pancreatitis

There is little certain knowledge regarding the natural history of pancreatitis, but many patients may have only a single attack in their lifetime. Some patients, however, will have repeated attacks of the disease and thus fall into the group with relapsing acute pancreatitis. It is exceedingly important to distinguish this group, in which the intervals of remission permit healing of the pancreas, from that with relapsing chronic pancreatitis, in which the disease follows an exorable, destructive course. Sphincteroplasty may be highly effective in relapsing acute pancreatitis, whereas in relapsing chronic pancreatitis this procedure may be of little value.

Summary

The diagnosis and treatment of acute pancreatitis are reviewed. The occurrence and gravity of postoperative pancreatitis are emphasized. The possibility of hyperparathyroidism as a cause of pancreatitis should be kept in mind. The roles of antienzymes and surgical decompression as methods of early management are discussed.

References

1. Elliot, E. W. and Williams, R. D.: A re-evaluation of serum amylase determinations. Arch Surg 83: 146, 1961.
2. Fitz, R. H.: Acute pancreatitis: Consideration of pancreatic hemorrhage, hemorrhagic, suppurative, and gangrenous pancreatitis and disseminated fat necrosis. Boston Med Surg 120: 181-187; 204-207; 229-235, 1889.
3. Child, C. G. and Kahn, D. R.: Current status of therapy of pancreatitis. JAMA 179: 363, 1962.
4. Gambill, E. E. and Mason, H. E.: One hour value for urinary amylase in 96 patients with pancreatitis. JAMA 186: 24, 1963.
5. Cope, O., Culver, P., Mixter, C. and Nardi, G. L.: Pancreatitis associatted with hyperparathyroidism. Ann Surg 145: 857, 1957.
6. Warren, K. W. and Cattell, R. B.: Pancreatic surgery. New Eng J Med 261: 333, 1959.
7. Nardi, G. L.: Current concepts in therapy: Pancreatitis. New Eng J Med 268: 1065, 1963.
8. Salzman, D. W. and Nardi, G. L.: Emergency operation for internal decompression: The role of pancreatic duct exploration in acute pancreatitis. In Mulholland, H. H., Ellison, E. H. and Friensen, S. R.: Current Surgical Management. Philadelphia, W. B. Saunders Company, vol. 3 (In press.)
9. Howat, H. T.: Chronic pancreatitis. Lancet 2: 1234, 1963.

FROM THE NOTE BOOK

AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY

The next Part I (written) examination of this Board will be given at 10:00 A.M. on Saturday, July 2, 1966. Applications will be accepted for this examination only during January and February 1966.

All candidates having completed an approved progressive residency training program with eighteen months each of obstetrics and gynecology as of June 30, 1966 will be eligible to apply. Application forms and current bulletins may be obtained by writing to the office of the Secretary—Clyde L. Randall, M.D., American Board of Obstetrics and Gynecology, 100 Meadow Road, Buffalo, New York 14216.

Diplomates of this Board are urged to keep the Secretary's office informed of any change in address.

ORAL CONTRACEPTIVES

Thrombosis

The possible association of thromboembolic disease with oral contraceptives must be considered seriously in light of the increasing number of cases. The present report concerns three healthy women who developed intravascular thrombosis while receiving oral contraceptives. One patient died. Autopsy revealed thrombosis of the internal carotid artery, a finding which again suggest that in addition to the more common thrombophlebitis of the legs and pulmonary embolism, arterial thrombosis may be a complication of oral contraceptive therapy.—Nevin et al. (Belfast), British M J 1: 1586, June 19, 1965.—Republished from CLIN-ALERT®, No.187, July 17, 1965, by permission of Science Editors, Inc.

CHLOROMYCETIN

Optic Atrophy

Attention has been previously directed to visual changes associated with Chloromycetin (chloramphenicol) therapy (Clin-Alert No.63,1962). Nine cases of blindness due to optic atrophy presumably induced by the antibiotic are on record. The reaction is not fully understood. Apparently, vision may fail without any fundal changes, but optic neuritis and papilledema have also been reported. Available information does not give clear guidance to either treatment or prognosis. There seems to be some hope of recovery if Chloromycetin is discontinued at the onset of visual disturbance, but clearly the proper course is not to expose the patient to danger from prolonged use of the drug. Leading Articles, British M J 1: 1511, June 12, 1965. Republished from CLIN-ALERT®, No. 188, July 17, 1965, by permission of Science Editors, Inc.

U.S. NAVAL MEDICAL RESEARCH REPORTS

U.S. Naval Submarine Medical Center, Submarine Base, Groton Conn.

1. Lighting Survey of USS Sea Owl (SS–405): MR 005.14–1100–1.16, August 1964.

U.S. Naval Aviation Medical Center, Naval School of Aviation Medicine, Pensacola, Fla.

1. Effect of Changing Resultant Linear Acceleration Relative to the Subject on Nystagmus Generated by Angular Acceleration: MR 005.13–6001 Subtask 1 Report No. 99.
2. Visual Illusions of Movement: MR 005.13–6001 Subtask 1 Report No. 90, October 1963.
3. Visual Illusions of Movement: MR 005.13–600.1.1.90 1965.
4. Changes in Spontaneous Activity as a Measure of Sensitivity to Rotation in the White Rat: MR 005.13–6001 Subtask 1 Report No. 103, January 1965.
5. Some Issues in the Development of a Motion Sickness Questionnaire for Flight Students: MR 005.13–6001 Subtask 1 Report No. 104, March 1965.
6. Some Relationships Between Blood Alcohol, Positional Alcohol Nystagmus (Pan), and Postural Equilibrium (Ataxia): MR 005.13–6001 Subtask 1 Report No. 105, March 1965.
7. A New Quantitative Ataxia Test Battery: MR 005.13–6001 Subtask 1 Report No. 107, March 1965.
8. Comparative Effects of Prolonged Rotation at 10 RPM on Postural Equilibrium in Vestibular

Normal and Vestibular Defective Human Subjects: MR 005.13–6001 Subtask 1 Report No. 108, March 1965.

9. Habituation to Complex Vestibular Stimulation in Man: Transfer and Retention of Effects From Twelve Days of Rotation at 10 RPM: MR 005.13–6001 Subtask 1 Report No. 109, March 1965.
10. Evaluation of Some Antimotion Sickness Drugs on the Slow Rotation Room (No. 1): MR 005.13–6001 Subtask 1 Report No. 110, March 1965.
11. The Effects of Exposure to a Rotating Environment (10 RPM) on Four Aviators for a Period of Twelve Days: MR 005.13–6001 Subtask 1 Report No. 111, March 1965.
12. The Influence of Fibrations on Chromosomes: MR 005.13–9010 Subtask 7 Report No. 1, April 1965.
13. Symptomatology Under Storm Conditions in The North Atlantic in Control Subjects and In Persons With Bilateral Labyrinthine Defects: MR 005.13–6001 Subtask 1 Report No. 112, May 1965.
14. Tissue Dosages from Alpha Particles and Heavy Nuclei in Solar Particle Beams in Space: MR 005.13–1002 Subtask 1 Report No. 32, June 1965.

DENTAL SECTION

Naval Dental Research Reports

Continuing the schedule followed in the previous four issues of the *U.S. Navy Medical News Letter,* the abstracts of the seventh and eighth reports of the U.S. Naval Dental Corps' intramural research program are presented herewith.

Concerning the authors, the report of LT G. T. Eden, DC USN, is a product of his recently completed Postdoctoral Fellowship at the U.S. Naval Dental School with Additional Duty at the National Bureau of Standards. R. M. Waterstrat, BS (Metallurgical Engineering), is a Research Associate of the American Dental Association, in the Dental Research Section, National Bureau of Standards, Washington, D. C. The research background of LCDR H. J. Keene, DC USN, was presented with the fourth abstract of this series. These abstracts are reproduced with the permission of the Editor, Journal of Dental Research.

EFFECT OF PACKING PRESSURE ON TENSILE STRENGTH OF COMMERCIAL AND SPHERICAL DENTAL AMALGAMS

LT G. T. Eden, DC USN and R. M. Waterstrat.

Cylindrical amalgam specimens were prepared under standardized conditions from 8 different size ranges of spherical alloy powders and from two commercial alloys. Specimens were condensed by a method of constant pressure packing at five different loads from 80 psi to 2000 psi. The tensile strengths of all specimens were determined by the diametral compression test method. The tensile strength of amalgams prepared from spherical alloy powders is apparently less affected by low packing pressures than the tensile strength of the commercial alloy amalgams. At low packing pressures (80 psi) the surface of spherical alloy amalgams is smooth and almost totally unmarred by the macroscopic voids and cervicular laminations which characterize the commercial alloy specimens. The spherical alloys possess a greater ability to adapt themselves to the cylindrical mold cavity at low packing pressure. These laboratory observations are supported by clinical evidence obtained in a previous investigation and indicate that the use of spherical amalgams may permit significant improvements in marginal adaptation, reduction in packing pressures and elimination of the necessity for using small packing increments.

DENTAL ANOMALIES ASSOCIATED WITH LOW BIRTH WEIGHT

LCDR H. J. Keene, DC USN.

Premature birth, defined as birth weight of 5.5 pounds (2500 Gm) or less, occurs in approximately 6.3% of the deliveries of white males in the U.S. (Silverman, A., Dunham's Premature Infants, 1961). Neonatal mortality and congenital malformations appear to be higher than average in this group and there is reason to suspect that dental development may also suffer. This study was concerned with the relationship between birth weight and two selected anomalies of the permanent dentition, hypodontia and rudimentary teeth. Clinical, roentgenographic

and birth weight data were obtained on 387 white male naval recruits 17 to 25 years of age. The sample consisted of a control group with no anomalies, an anomaly group with agenesis of at least two third molars, and a twin group. In the control group (136 men) the incidence of premature birth was 5.1%; in the anomaly group (150 men) the incidence was 10.0%. Ninety-seven recruits in the anomaly group had agenesis of three or more teeth, and 13.4% of these men had a birth weight of 5.5 lbs or less. In 101 men with a history of twin birth, the incidence of prematurity was 49.5%. The twins who were premature had a relatively high incidence of dental anomalies. 46.0%, as compared with 21.6% for those who were not premature. The overall incidence of dental anomalies in the twin group was 33.7%. There appears to be an increased incidence of congenitally missing and rudimentary teeth in naval recruits with a history of low birth weight.

PROTECTION OF NORMAL HUMAN PULP EXPERIMENTALLY EXPOSED TO THE ORAL ENVIRONMENT

Cabrini, R. L., Maisto, O. A., and Manfredi, E. E. Oral Surg, Oral Med and Oral Path 19(2):244–246, February 1965.

The authors describe experimental wounding of the pulp of seven human teeth using sterile instruments but not protecting the teeth with a rubber dam. The pulp hemorrhage was controlled by water lavage from the syringe of the dental unit and the cavity dried with non-sterile cotton pellets. The patient was permitted to close his mouth for periods of five to ten minutes to expose the pulp to the oral flora. Afterwards, the cavity was dried and the pulpal opening covered with calcium hydroxide in paste form. This was additionally covered with zinc oxide-eugenol and silicophosphate cement.

After periods varying from 62 to 84 days, the teeth were extracted and prepared for microscopic study. Histologic studies showed all teeth to have had normal pulps at extraction time. Each exposure site showed the formation of a dentinal bridge, some of tubular dentin and some amorphous.

This report illustrates the therapeutic value of calcium hydroxide in pulp treatment. It also demonstrates the healing capacity of the dental pulp. This report is based on a small number of cases. Septic clinical procedures are not recommended. Nevertheless, this report suggests that, under otherwise correct procedures, if asepsis is lost e.g. through rubber dam failure, success of a pulp capping is not precluded by inadvertent contamination.

ADHESIVE POWDERS FOR DENTURES

JAMA 191(10): 172, 8 March 1965.

A patient uses liberal amounts of a dental plate powder which contains karaya gum and sodium borate. Is there danger that toxic amounts of boric acid could accumulate after daily use of this product?

Denture adhesive powders are made from finely powdered vegetable gums such as karaya or synthetic substances with small amounts of essential oils. Sodium borate may be added although its usefulness has not been demonstrated except to neutralize acidity of the karaya.

The fraction of sodium borate contained in denture adherent preparations is usually no higher than 12%. It is virtually impossible to know the frequency of application, the amount of powder used per application nor the fraction of the applied powder that may be ingested. Possibly there might be no more than about 0.5 gm of borate in three liberal applications per day to a set of full dentures. If 10% were ingested, this would represent only about 50 mg of borate (slightly less boric acid) daily. This writer is aware of no reports of borate toxicity from use of denture adhesives but to reflect a very cautious attitude one might suggest a nonborate preparation for patients with impaired renal function.

A more frequent danger, very likely, is the improper use of a denture adhesive in order to tolerate an ill-fitting appliance that may cause injury to the supporting tissues.

CHILDREN'S GUM CAVITIES LINKED TO PROLONGED BOTTLE FEEDING

JAMA 191(9): 41, March 1965.

Paul K. Losch, DDS, Chief of Dentistry at Children's Hospital Medical Center, Boston, Mass., has reported a clinical observation in the increased number of dental caries in children between the ages of 1 and 3. Dr. Losch puts the blame on the common practice of prolonged or improperly regulated bottle feeding.

"Thousands of children in the United States are suffering from damage of this origin," he stated. "We have noted an approximate 1,200% increase in the number of gum cavities in the newly erupted teeth in the last five to ten years in our clinic alone."

"We used to see such cavities as infrequently as once a month. Now, we are seeing them as much as three or four times a week. Keeping these children on demand feeding when not necessary and permitting them to stay on the bottle long after they have developed enough to be spoon-fed is a fairly common pediatric practice," Dr. Losch told reporters of the JAMA.

He also cautioned against propping the bottle to feed the child in bed and allowing the child to go to sleep with the bottle in his mouth. "The parent gets into the habit of propping the bottle in the same position at each feeding. The result is that the same area of the mouth—and the same teeth—are being exposed to the milk curds." Such overexposure of the childs teeth permits the acid media of the mouth to break down the curds thus causing an etching of the enamel. "This acid-etching of the tooth is, of course, accepted as an initiator of dental decay."

ACKNOWLEDGMENT

In the U.S. Navy Medical News Letter 46(4): 19, of 27 August 1965, in the news release titled *Historical Dental School Receives Navy Alumnus Memento,* cropping of the accompanying photograph inadvertently lost a paragraph, as follows.

"At the presentation ceremony were (left to right) Admiral Kyes, Rear Admiral Alfred W. Chandler, DC, USN (Ret) and Doctor John J. Salley Dean, University of Maryland School of Dentistry.

Dr. C. Willard Camalier, Dr. J. Ben Robinson and Admiral Chandler represented the American Academy of the History of Dentistry.

Doctors Camalier and Robinson are past-presidents of the American Dental Association; Admiral Chandler is a former Assistant Chief of the Bureau of Medicine and Surgery (Dentistry) and Chief of the Dental Division."

PERSONNEL AND PROFESSIONAL NOTES

NAVY DENTAL TEAMS VOLUNTEER WEEKENDS TO AID VIETNAMESE IN UP-COUNTRY AREAS

SAIGON—Every Saturday morning a small band of U.S. Navymen, indistinguishable as seafarers in jungle-green combat uniforms, climb aboard armed convoy vehicles destined for an objective in a steaming Vietnamese jungle, muggy rice-paddy hamlet, or neat agricultural village.

The mission: Work on developing healthier smiles for Vietnamese civilians and military dependents in one of the war's most unique people-to-people operations.

The Navymen are dental officers and enlisted dental technicians assigned to U.S. Navy Headquarters Support Activity, Saigon.

For the past year, teams of from two to four Navy dentalmen have been pursuing a weekend preventive dentistry and oral hygiene program for Vietnamese who have little or no access to professional care.

In the words of CAPT Stanley T. Uyeda of Honolulu, Hawaii, the Navy Dental Corps officer who now heads the operation: "the Navy is willing to go anywhere, anytime, to perform humanitarian services."

CAPT Uyeda's Dental Department has the primary responsibility of serving some 10,000 American troops and government employees—plus Australian, New Zealand and Republic of Korea military elements—in the Saigon area. The department

HER SMILE'S HEALTHIER. A Vietnamese girl, held by her soldier father, tries her first smile after a decayed tooth was extracted by U.S. Navy Dental Corps CAPT Glenn D. Richardson during a volunteer dental operation at Hoc Mon village, some 20 miles northwest of Saigon. Dental officers and technicians from U.S. Navy Headquarters Support Activity, Saigon go on aid missions in the field each weekend. CAPT Richardson is now on duty at the U.S. Navy Base, Long Beach, Calif.

performs an average of more than 4,000 dental procedures monthly.

CAPT Glenn D. Richardson of Tonica, Ill., who began the people-to-people dental program in mid-1964, said, "the principal reason we are doing this is to relieve pain and attempt to halt the cause of infection. We are performing very elementary dentistry, we would like to do more, much more."

More than 2,000 Vietnamese, including wives and children of Vietnamese troops, in locations ranging from just off the Cambodian border to hamlets in the countryside outside the Saigon perimeter, have been treated by the Navy teams.

The teams have moved to their objectives aboard jeeps, armored personnel carriers and helicopters—and on two occasions, pushed afoot through jungle tracks.

CAPT Richardson, now serving at the U.S. Naval Dental Clinic, Long Beach, Calif., was presented the Vietnamese Army Medal of Honor, First Class, for originating and developing the dental field program.

The Vietnamese Medal of Honor, Second Class, was presented to Navy Dental Technician Third Class Thomas L. Brown of Mansfield, Ohio, for his participation in the program. The medal was pinned on Brown by Vietnamese officials during a dental operation in Hoc Mon village 20 miles northwest of Saigon.

All five dental officers and 13 dental technicians assigned to the Dental Department have volunteered for field operations. The weekend dental calls take teams through, and into, territory in which Viet Cong activity is present in varying degrees.

Chief Dental Technician Jack C. Nicholl of El Cerrito, Calif., who has spent more time in the field than all of his colleagues, likens the aid operations to the circuit-riding dentists of the old American West. "Just like Doc 'Painless' Potter of the frontier days, we have to live with the possibility of imminent ambushes and raids. The Viet Cong have replaced the Indians in the picture."

The village of Binh Canh, northeast of Saigon, was overrun by the Viet Cong shortly after the dental men had finished their second visit.

Aiding the civilian population in Vietnam—"civic action" in current military terminology—is a major weapon against the communists. The Viet Cong have a history of attacking civic action parties operating in isolated villages and hamlets.

But toothaches don't choose sides.

LT David C. McChesney of Erie, Pa., and Dentalman Martin F. Brede of Bellevue, Pa., had just extracted an offending tooth from the jaw of a teenage youth when a Vietnamese Army interpreter announced that the fellow was a recent Viet Cong defector.

Known only as "Phoung," the 16-year-old boy had been a tough, once badly-wounded, veteran of six months with the Viet Cong. He twice planted road mines which exploded under Vietnamese Army convoys. Phoung had expected a good deal of pain, but was surprised when even the anesthetic syringe didn't hurt. When LT McChesney showed him the extracted tooth, Phoung smiled and warmly shook hands.

Selection of weekend objectives is usually made by U.S. Military Assistance Command, Vietnam, headquarters. The selections are based on requests for dental teams from U.S. advisers in the field. The advisers normally provide heavily-armed guards and an interpreter.

"When one of the teams arrive in a village or hamlet," says Chief Nicholl, "people are almost always waiting for us."

"Many of them will have been living with their toothaches and pains for a long time."

The patients span ages from infancy to the nineties. Their dental problems stem from inadequate diets, neglect, impure water and the chewing of betel nut—an Asian version of chewing gum. In the bulk

JOINT OPERATION. U.S. Navy Dental Corps CAPT Glenn D. Richardson (left) and Chief Dental Technician Jack C. Nicholl, assisted by a Vietnamese nurse's aide, begin a tooth extraction at the village clinic in Hoc Mon, some 20 miles northwest of Saigon. CAPT Richardson, now on duty at the U.S. Naval Base, Long Beach, Calif., initiated a program of volunteer dental missions to Vietnamese communities in the field in mid-1964.

of cases, the only remedy is extraction; many teeth are decayed far beyond hope of treatment.

"Getting treatment started," says Chief Nicholl, "involves a kind of ritual.

"We get the interpreter to explain that we will examine teeth, and if the dentist feels an extraction is necessary, he says we first give an injection of anesthetic which makes the extraction painless. Then we find the most heroic volunteer—usually it's a child—and perform an operation to show how easy and painless it is.

"Once we had to use sleight-of-hand to prove our point. With the smiling cooperation of our volunteer, we 'extracted' the same tooth six times."

In a typical working day, two dental teams may spend nine or ten hours on their feet working on more than 200 patients.

"We've never left a village or hamlet without a barrage of cheering and clapping from our patients," said the chief.

CAPT Uyeda, who came to Vietnam with a long history of working with dental and medical authorities in the Far East, notably in Japan and the Philippine Republic, is formulating a program which he hopes may bring continuing dental aid to Vietnamese outside of the large cities.

His concept is a six-week training program in basic preventive dentistry and oral hygiene for village medical assistants. That would, feels the captain, assure continuance of the kind of work he and his people are doing.

"We would also like to get the U.S. Navy Dental Technician Manual translated into Vietnamese," he said, "it's one of the best basic texts in print."

Chief Nicholl and some of his dentalmen, working with Vietnamese military counterparts, have already singled out mutually agreeable Vietnamese words for dental terminology and equipment.

Some training is now underway. The Navy Dental facility in Saigon has employed several Vietnamese civilians for on-the-job training as dental assistants.

"They work out very well," states CAPT Uyeda, "and since two of them are females, our American patients getting their teeth cleaned or x-rayed, are convinced we are doing the right thing."

Navy dental personnel have also used a little-known specialized branch of their profession, the construction of maxillo-facial devices, in aiding wounded Vietnamese. This involves the making of life-like masks for battle casualties who have lost portions of their faces; it also includes manufacture of artificial eyes, noses and ears.

IN FIVE MINUTES HE'LL BE SMILING. A Vietnamese mother points to her infant son's bad tooth for Navy Dental Corps CAPT Stanley T. Uyeda (left) and Chief Dental Technician Jack C. Nicholl (right). The Navy dental men were on a volunteer weekend operation in the Nha Be area south of Saigon. Teams move out from U.S. Navy Headquarters Support Activity, Saigon, each weekend to treat Vietnamese people in rural areas.

CAPT Richardson and Dental Technician First Class Gradie K. Maness of Henderson, Tenn. (now on duty at the U.S. Naval Dental Clinic, Yokosuka, Japan), pioneered a maxillo-facial program at the Cong Hoa Vietnamese Army Hospital just outside Saigon.

In addition to the assigned task of treating American and allied personnel, and the voluntary extra-curricular operations with the Vietnamese people, the Dental Department is part of the U.S. military emergency force in Saigon.

Trained in combat first aid, dental men work with Navy Medical Department doctors and hospital corpsmen in reacting to Viet Cong terrorist activity in the Vietnamese capital. All Navy medical and dental personnel carry Red Cross arm bands—even when off duty.

In some cases, dental men were treating casualties at bombings—at the recent attack on Vietnamese National Police Headquarters for example—before ambulances arrived at the scene.

"Sometimes," mused Chief Nicholl, "we almost forget the fact that most of us joined the Navy to go to sea. . . . but we figure we're upholding the traditions of the Navy Dental Corps. We're glad to get out with the Vietnamese people. The fact that there's an element of danger in it is overshadowed

by the thanks of the people we're helping." (Photos are Official U.S. Navy Photographs by Robert W. Dietrich, JOCS, USN.)

NDS STUDENT LAUDED. The Commanding Officer's Award for Excellence in Operative Dentistry at the U.S. Naval Dental School, Bethesda, was awarded to LCDR Malcolm S. Davis in June. CAPT A. R. Frechette, former CO of the school presented the award during graduation exercises for 36 dental officers who completed residencies and long courses of graduate level instruction.

The award has been presented each year since 1959 to that officer most successful in his efforts "to develop the skills of the general practitioner to the highest possible point."

LCDR Davis, 31 was first in his class and honor man in that portion of the program affiliated with Georgetown University's Graduate School. A native of Georgia, he was commissioned in 1957. He received his D.D.S. Degree from Emory University School of Dentistry in Atlanta. He has been selected to remain at the Dental School for one year residency in Endodontics.

MARCORPS CITES DENTAL PERSONNEL. Major General Frank C. Tharin, Commanding General, U.S. Marine Corps Air Station, El Toro, California, sent Letters of Commendation to the following dental personnel under his command:

CAPT F. A. Papera, DC USN HQ MCAS
CAPT J. F. King, DC USN 3d MAW FMFPAC
LCDR R. C. Corderman, DC USN HQ MCAS
LT K. H. Walter, DC USNR 3d MAW FMFPAC
LT E. M. O'Reilly, DC USNR 3d MAW FMFPAC
LT C. O. Caldwell Jr., DC USNR 3d MAW FMFPAC
B. J. Strain, DTC USN HQ MCAS
M. A. Clayton, DT2 USN 3d MAW FMFPAC
E. D. Moody. DT2 USN 3d MAW FMFPAC
J. W. Dungan, DT3 USN 3d MAW FMFPAC
W. G. Karp, DT3 USN MAW FMFPAC

The Commendations read in part:

1. During the early morning hours of 25 June 1965, a tragic aircraft accident adjacent to Marine Corps Air Station, El Toro resulted in the deaths of eighty-four (84) military personnel. The reaction to this disaster by all hands was immediate and unhesitating. It would be impossible to commend each of the innumerable personnel who provided assistance during this emergency; however, the performance of certain individuals has been brought to my attention and is definitely worthy of personal recognition.

2. It is with pleasure that I commend each of you for your outstanding performance of duty on this occasion. Your untiring efforts in assisting in the initial identification of the remains left little to be desired. Your professional and technical competence is reflected in the manner in which this difficult task was organized and brought to a successful conclusion.

NEGOTIATED CONTRACT FOR ARTIFICIAL TEETH AND TOOTH FACINGS AND BACKINGS. Contractors have reported to the Dental Division the recurrence of several common errors which have resulted in delays, needless expense, and misunderstandings between the ordering dental facility and the manufacturer. Some of the errors reported are:

1. *Arithmetic.* Many errors are due to simple mistakes in arithmetic, typing errors, and not reading the contract correctly.

2. *Obsolete shades and molds.* Many activities are ordering shades and molds of teeth which are no longer available. Do not order obsolete items to replenish stock. Check with the mold charts which are available free of charge from the manufacturers.

3. *Out-of-date Contracts.* Ensure that your contract is current and destroy superseded contracts. If you do not have a current contract you may obtain one from the Field Branch, Bureau of Medicine and Surgery, 3500 Broad Street, Philadelphia, Pennsylvania 19145. The current contract expiration date is 31 December 1965.

4. *F.O.B.* List the F.O.B. price at the origin of the supplier. Requisitioning activities have often listed the destination as the origin.

5. *Returning Teeth.* An accurate count of all returned teeth is necessary, ensure a double check.

6. *Exchange of Teeth.* Teeth may be returned for exchange, but those being returned must be currently manufactured. Teeth stamped with a "V" under the mould number are not currently manufactured. Read carefully the exchange portion of the contract.

7. *Liners.* No catalog for tooth drawer liners is available. Specify the brand and type of teeth for which the liner is to be used and the manufacturer will furnish the proper item.

STIGMA OF "GIRLS JOB" SOON TO END. In keeping with the civil rights law prohibiting discrimination of sex, color, etc., the first male nurse has

been accepted in the Navy Nurse Corps. Not to be outdone, Kevin M. O'Brien, DN USN, has been accepted for enrollment in the Fones School of Dental Hygiene, University of Connecticut. This is the first known acceptance of a male applicant by any American school of dental hygiene.

O'Brien recently completed a tour of duty aboard the USS Fulton, AS–11. Upon completion of two years training he will receive a certificate of Dental Hygiene that will permit him to compete in state board examinations for license. He will also be eligible to continue training towards a BA degree of Dental Hygiene.

PREVENTIVE DENTISTRY TIP. The use of ⅜ by 6 inch absorbent cotton rolls in lieu of the standard ½ by 1½ inch rolls greatly facilitates application of the stannous fluoride in a dry field. Both sizes of cotton rolls are available as standard stock items in the Federal Supply Catalog, class 6510.

AVIATION MEDICINE SECTION

A CHEMICAL EMERGENCY BREATHING OXYGEN SYSTEM FOR NAVAL AIRCRAFT UNDERGOING DEVELOPMENT

Currently naval aircraft emergency oxygen systems consist in part of a high pressure gaseous O_2 container. The quantity of oxygen in the emergency system is considered to be less than optimum for extremely high altitude escape and a reserve supply for sea level usage.

Any sizable increase in quantity and duration utilizing current design concepts would impose an unacceptable weight and space penalty. Accordingly, a development program has been established, having as its objective a completely new system which will substitute a chemical, such as potassium superoxide (KO_2), to supply the breathing oxygen. If the effort is successful, it will result in a highly improved lightweight system and no longer require heavy containers for high pressure gas storage.

The operational system will provide sufficient emergency oxygen for any ejection altitude up to 70,000 feet and include an additional five (5) minute supply at sea level. The system will also be suitable for underwater use.

Some of the general characteristics are:

(1) Volume and design will be such as to assure compatability with currently used rigid seat survival kits.

(2) Weight not to exceed ten (10) pounds.

(3) System actuation and performance will be such that it will be actuated by the same type mechanism currently used for existing emergency oxygen systems. It will provide a means for the removal of any contaminants which may be inherent in the oxygen production mechanism.

(4) Reliability/Maintainability of the system will be maximal and its reliability not less than 98 %.—Code 522, BuMed.

RESEARCH AND DEVELOPMENT ON OPEN AND CLOSED CYCLE REBREATHING SYSTEM FOR AIRCREWMEN

A research and development program is being conducted at the Navy Aerospace Crew Equipment Laboratory, Philadelphia, Pennsylvania on a 10-hour duration open and closed cycle rebreathing system in order to determine the feasibility of incorporating such a system in high performance aircraft. At the present time, long duration flights in Naval aircraft, utilizing a liquid or gaseous oxygen supply imposes a space and weight penalty for new aircraft designs. In addition, the logistics problem associated with supporting aircraft with liquid oxygen systems is expensive and limits overall fleet operation where liquid oxygen availability is marginal or non-existent.

Therefore, the problems of weight, storage, and logistics support for aircraft life support systems can be reduced considerably by an economical utilization of an open and closed cycle rebreathing system. The requirements of the developmental system are:

1. Supply the metabolic oxygen needs of the pilot for a 10-hour period.
2. Absorb the metabolic carbon dioxide.
3. Absorb excess water vapor produced by respiration.
4. Automatic elimination of nitrogen from the system.
5. Provide pressure breathing as required in open and closed circuit.

6. Maintain adequate pressures during emergency type cabin decompression.

7. Automatically provide 100% oxygen in event of decompression.

The rebreathing system is for a 10-hour duration when used in the open and closed circuit and which utilizes an automatic nitrogen elimination purge system. A timing mechanism incorporated into the system automatically goes to the open circuit for three minutes (breathing 100% oxygen) then to the closed circuit for 27 minutes for three such cycles during the first 1–½ hours; and then by virtue of the automatic operation of the system, it will convert to a cycle which will consist of one minute open circuit breathing and 29 minutes closed circuit breathing cyclically for the next 8–½ hours.

The system will automatically provide 100% oxygen in the event of a decompression or power failure and also provides for manual operation in either the closed or open circuit as desired.

Baralyme is used as the CO_2 absorbent to remove CO_2 from the system in the closed circuit.—Code 522, BuMed.

MIXED GASES FOR SPACE FLIGHT USE

The Navy Aerospace Crew Equipment Laboratory, Philadelphia, Pennsylvania, is involved in experimental studies sponsored by NASA to determine the physiological effects of breathing mixtures of oxygen and an inert gas on the incidence of aeroembolism (bends) following decompression from an altitude of 18,000 feet to 35,000 feet. Past studies utilized nitrogen as the inert gas. In the present study, helium will be used.

Helium and oxygen as a breathing gas has been used in diving and in other underwater categories involving pressures in excess of one atmosphere but it has been used only infrequently at reduced atmospheric pressure.

The results of the Navy investigation may effect future decisions relative to the internal gaseous atmosphere of the Manned Orbital Laboratory (MOL) and other space flights. Past Mercury and Gemini flights have used 100% as a breathing atmosphere. However, there are some undesirable physiological effects associated with prolonged usage of 100% oxygen, as well as a definite fire hazard. Two highly significant fires have occurred during simulated space flights with human subjects. A marked reduction in the percentage of oxygen by the use of an inert gas will reduce the hazard of fire. One of several reasons why nitrogen has not been used is attributable to its weight. Nitrogen has an atomic weight of 14.008 and helium 4.003. Payload weight penalties could be appreciably decreased by the use of helium.—Code 522, BuMed.

NOW HEAR THIS!—CAN YOU?

LCDR H. R. Bower, MSC USN

Most of us take our ability to hear for granted. We tend to connect the inability to hear with the very old or, occasionally, with the unique ability of our children not to hear what they dislike. The hearing ability of children is usually adequately protected by parental concern, teacher interest, and hearing test programs conducted by some school systems. From childhood to old age, there is little or no attention given to the *conservation* of hearing for the general public, except the attention of the individual himself.

How good is *your* hearing? In a recent study by this author[1] of 2,000 audiograms of military personnel at Marine Corps Air Station, El Toro, showed that 59 percent of the individuals had abnormal audiograms (20 db or more in any test frequency). In a study by O'Connell [2] on 5,171 Air Force Recruits, only 27 percent were abnormal. Within the speech frequencies (500, 1000, and 2000 cps), 11 percent of the El Toro group were abnormal, while less than one percent of the recruits had abnormal audiograms. By age groups, the younger individuals (age 17) of the El Toro study compared favorably with the recruits. However, a sharp increase occurs above this age and at age 21 about half of the individuals tested at El Toro had abnormal hearing thresholds.

The rapid increase of abnormal hearing levels among the younger military man would indicate that the educational phase of the Hearing Conservation Program requires more emphasis. Ideally, the education of the individuals to the potential hazard of exposure to high intensity noise, would be most effective if given as part of the curriculum of initial training programs on entrance into military service. It would also be of great value to include in other service schools, especially those preparing the individual for the more noise hazardous occupations such as aviation.

There is a certain amount of resistance by many individuals in complying with requirements of a Hearing Conservation Program, because it does require that these men spend time away from their primary jobs. But, by looking back in time and comparing the noise from 1900 up to the present, the need for a Hearing Conservation Program is self evi-

dent. The horse and wagon has been replaced by automobiles and trucks. The airplane was developed and replaced with jets, and now sonic booms are beginning to bombard the countryside. Even the area of children's toys has been invaded by a constant increase of noise. Children used to place cards in contact with bicycle spokes to make them sound like a motorcycle; now they can buy a noise maker to install which produces a sound pressure level bordering on hazardous to hearing! Toy trucks and cars now come equipped with engine noise, some reaching sound pressure levels as high as 94 db at 2000 cps.

At the present time the interest in reducing noise is gaining momentum, although it is lagging far behind the rate of noise increase. Many of the larger industries have active programs to protect the hearing of their employees. This type of program if applied properly and enforced, is very effective. However, there seems to be very little interest in applying this type of program to their products. Recently, the Marine Corps has introduced a new MuHi-purpose vehicle which is to replace many of the vehicles currently in use. After this new vehicle had been in use locally for several months, sound pressure levels were taken. The over-all sound pressure levels varied from 97 db at idle to 104 db at 60 miles per hour. BUMEDINST 6260.6A states, "Hearing conservation programs should be mandatory where noise sound pressure levels reach 95 db." The noise level of the vehicle has been referred to the appropriate Bureau for action.

It is interesting to note that one of the major automobile manufacturers is currently advertising in newspapers and on television that their automobile is quieter than another competitive car. In one recent ad for this car, the sound pressure levels were listed for several different speeds. Although this may be primarily an advertising gimmick, it is a step in the right direction, both to lower the noise exposure levels and, even more important, it may cause the general public to be more aware of the problem associated with high noise levels.

A hearing conservation program, no matter how well it is organized, is no better than the willingness of the individual involved to participate in the program. The individual's willingness to participate will be a direct result of the effectiveness of the educational phase of the program.

References

1. Bower, H. R.: Hearing Losses Among 2,000 MCAS Personnel. Station Hospital, MCAS, El Toro, February, 1965.
2. O'Connell, M. H.: Hearing Acuity of Air Force Recruits. USAF School of Aviation Medicine Report, 58-70, April, 1958.

"WATCH THOSE CRASH DIETS"

The investigation of a recent aircraft accident, resulting in two fatalities, revealed that the pilot had been on a "crash diet" for approximately 20 days immediately prior to the accident. The pilot had lost 30 pounds during this period in order to pass his annual physical examination. He had taken and passed his physical on the day prior to the fatal flight and had consumed a normal three meals a day at that time. His "crash diet" was allegedly 350 calories or less per day, however, there were numerous indications that he did not strictly follow the stringent diet. For nearly one year previously, his squadron flight surgeon had him on several more conservative diets, but response had not been successful, apparently due to failure to observe proper caloric intake. Daily urine analysis revealed no acidosis and thus failure actually to comply with the diet.

Although the alleged starvation diet and rapid weight loss were not considered to be contributory to the accident, an opinion concurred in by the Bureau of Medicine and Surgery, this accident report does bring out several pertinent points worthy of comment.

Except in a most unusual case, and one based on medical reasons, personnel should not be placed on so-called "crash" or "starvation" diets. Certainly such a procedure should not be condoned just to "get by" the annual flight physical. If for some sound medical reason, flight personnel must be placed on a starvation diet, they should be grounded, admitted to the sick list and undergo such a strenuous regime under close medical observation. In other words, the individual is under therapeutic management for a condition that disqualifies him for flight duties until satisfactory response is obtained.

SECNAV Instruction 6100.3 on weight control sets forth the desires of the Secretary of the Navy regarding obesity and physical fitness and outlines the responsibilities of commanding officers and medical officers in this area. BUPERS Instruction 6100.6 further amplifies this SECNAV Instruction and outlines procedures to follow with individuals who fail to satisfactorily conform to standards. These instructions clearly show the flight surgeon's role in following personnel who need weight reduction and the requirement for keeping the commanding officer informed as to satisfactory or unsatisfactory progress by such individuals.

Personnel who annually must go on an all-out program, often including the use of "reducing pills",

to lose weight in order to pass their flight physical, cannot be considered to be maintaining satisfactory progress with weight control. The flight surgeon should, therefore, make suitable recommendations, including that of grounding, to the commanding officer. The loss of a month or two of flight pay frequently proves to be a stronger incentive to lose and maintain proper weight than does all the medical advice regarding the deleterious effects of obesity.

Closely akin to the "crash diet" for the rapid loss of weight is the use of the so-called "reducing pills" or anorexic drugs. The routine and indiscriminate use of such drugs in weight control for any person should not be condoned, and is definitely contraindicated with flight personnel. If used by flight personnel, grounding is mandatory. Such drugs should be administered only when sound medical judgement dictates. These pills only act as "crutches" and do not supply necessary will power or develop proper dietary patterns.

"Fitness to Fly" is dependent upon many factors, and squadron flight surgeons must ever be on the alert for those things affecting their personnel; briefing his pilots and aircrewmen on a continuous basis. OPNAV Instruction 3740.7 provides a good outline from which such briefings may be prepared. Remember, the Flight Surgeon is the "Quality Control Officer" for the personnel of his squadron.—Code 522, BuMed.

REDUCING FIGURES

LCDR K. H. Dickerson, MSC USN, Naval Air Test Center, Patuxent River, Md.

The table and chair trembled, rumbling noises came from the depths, there was a rush of air and the dripping of water, metal clashed, and grunts rent the air, onlookers stood aghast—and a big fat man finished his soup. Have you ever wondered why fat people are the object of so many jokes and receive the brunt of so much fun-poking? Or, perhaps you find refuge in the fact that others refer to you as portly, stocky or stout. Well, fellows, here comes the bitter blow. Those are synonyms for fat, obese and corpulent.

Actually adiposity is no laughing matter. If you don't believe being fat is an unhealthy sign, take a look at what it does to your life insurance premiums. If you are overweight, your chances for a premature one-way trip to the marble garden are increased by: 149% as a result of cardiovascular disease, 206% from gall bladder disease, 223% from appendicitis, 383 from diabetes. Expressed in VITAL statistics: for every inch your belly exceeds your chest, scratch two years from your life expectancy.

Carrying around 25 pounds excess fat is like a person of correct weight going around with 25 pounds of rocks strapped on his back. If you saw someone doing this, you would no doubt think he also had rocks in his head. Well, if you are overweight and doing nothing about it, then your own cranium is not exactly pebble-free.

You aviators have additional difficulties if you are a bit fatty, such as additional hazards in safe ejection and escape from your aircraft, discomfort due to a tight (mis)fit in your cockpit, and your increased proneness to aeroembolism (decompression illness, bends, chokes, etc). So now is the time to do your part to lighten the load for easier hot-weather takeoffs.

Medical authorities still agree that the greatest single cause of obesity is overeating. Although heredity and glandular malfunction occasionally play a contributory role in obesity, there is only one immediate cause: *A caloric intake persistently exceeding the caloric output.* In other words, you are eating or drinking too belly-splittin' much. The great majority of military personnel are in relatively good internal condition so the factor of glandular disease presents a minimal problem. And this business of "hereditary obesity" can be boiled down mostly to an "inheritance" of faulty eating habits; handed down from hand to mouth you might say.

The capacity of the body to store protein and carbohydrates is strictly limited. So excess food in any form, be it steak, peanuts, whisky or a sandwich, is converted into and stored as fat. Of course this fat is a structure that is highly adaptable and capable of being molded into more attractive arrangements. It can be elevated, stretched, flattened, depressed, pointed, minimized, maximized or borrowed to conform with current more suitable female images. The most suitable male image is and will probably continue to be a slim and trim form. So the best thing you can do with adipose is get rid of it and avoid it like the plague.

To help you, we have come up with the following suggestions: You can eat all you want—just don't swallow! Or, with the combined help of all the drafting shops, for a nominal cumshaw arrangement, we will prepare a series of neatly lettered mottos for your use. For example, you sit down for supper, and a slip of paper falls out of your napkin saying: "This little piggy had roast beef." You reach into the box of candy and there is a notice: "Better you should

get lung cancer." You sneak off to the kitchen for a slice of ham and pinned to it there is a sign indicating it was baked by your favorite mother-in-law. Our fatman's special is designed to be sewed into your coat and reads, "I am a compulsive eater, a real 'foodoholic.' Anybody finding me in a candy store, at a soda fountain, or a bar, please notify my wife. Until she arrives, open my collar, tighten my belt, give me nothing but water, and physically restrain me if necessary."

You may not find these suggestions very useful, but it's very important that you do *do something* about your overweight condition. But don't ask your neighbor what to do. There's too much bad advice about obesity and reducing going around these days, and you might catch it. And don't go overboard on reducing either. You have spent several months or years adding that maximus to your gluteus, so don't try to remove it in three days. Weight reduction generally is a relatively slow process, but like the turtle, you won't get anywhere until you stick your neck out.

Stick it out and see your physician! Weight reduction requires medical supervision. Radical reducing diets are often dangerously deficient in essential nutrients or can cause metabolic upsets that will sort of wreck your "machinery." The aim in dieting is to obtain *proper nutrition* without getting a large economy size dose of calories. Your doctor can help you do just that. See him; then do what he says (even if he himself tends to be a mite plump).

Only three people stand to gain from your being overweight: 1. The man who will move up into your job sooner than he expected. 2. Your insurance beneficiary who will collect sooner than he expected. 3. The friendly undertaker, Digger Odell.

HAZARD OF SELF-MEDICATION TO THE FLIER

USAF Medical Service Digest, 15: 28, September 1964.

On 6 February 1964 a captain from an Air National Guard squadron declared an in-flight emergency while flying an F 89 aircraft in the area of his home base, stating to the tower that he was unable to maintain a good line of vision because of uncontrollable head movements. The head movements were of such a nature that the pilot was forced to remove his helmet and this cut off communications with the ground. The pilot managed to make a safe landing.

Immediately upon landing he was brought to the flight surgeon's office where the slow athetoid, side to side, front to back, uncontrollable head movements were noticed. Thorough neurologic examination at the time failed to disclose any significant neurological finding except for the head movements. Thorough questioning of the pilot disclosed that he had been taking propantheline bromide with thiopropazate dihydrochloride for a cold, the last of which he took just prior to taking off. Thiopropazate dihydrochloride is a drug of the phenothiazine group. The patient was having a typical athetotic seizure due to idiosyncrasy to the phenothiazine drug. After the pilot was hospitalized, the administration of 55 milligrams of benadryl I.V. completely obliterated the uncontrollable head movements. The pilot was thoroughly indoctrinated to the dangers of flying while on medication and he deliberately violated this basic rule.

In this instance it would have been entirely possible not only for the pilot to cause the loss of his own life and the lives of others, but also jeopardize the mission of this base had he crashed while attempting to land while physically incapacitated and without communication. The National Guard flight surgeon has again reemphasized the policy of drug administration and medical treatment of his flying people and has set up a program of much more stringent control over the treatment of flying personnel in his squadron. The basic responsibility belongs to the pilot who has complete control over his drug in-take.—Aeromedical Reports 1965.

HUMAN FACTORS IN A FATAL AIRCRAFT ACCIDENT

S/L W. J. C. Stevenson, C.D., Flight Surgeon, Prairie Medical Region, Royal Canadian Air Force.

This is an edited version of the original, which was published as a Prairie Medical Region Flight Surgeon's Bulletin. S/L Stevenson's discussion of the subject was, of course, not intended to be exhaustive, and the list of references covered only those likely to be readily available to unit flight surgeons.

One morning an officer cadet undergoing pilot training on T33 aircraft reported to his flight at 0730 hours following a night on the town. He flew a dual low level navigation exercise of 1½ hours duration, taking off at 0900. In the opinion of the instructor this exercise was carried out satisfactorily. However, subsequent investigation revealed that

there were indications of some serious breaches in airmanship, notably errors in "checks" and not maintaining adequate look-out. The instructor considered him sufficiently proficient to proceed with the solo low level navigation exercise which followed. He was extensively briefed for this exercise which was to be conducted at a minimal altitude of 800 feet above ground level over the same route. He took off on his solo mission at 1140 hours and the aircraft crashed at 1225 hours (approx.).

Subsequent investigations revealed that the aircraft was sighted by a reliable witness to be flying at an altitude of between 300 and 500 feet. Other witnesses who spotted the aircraft at various points along the route reported it to be at altitudes between 150 and 175 feet above ground level. The witness who saw the crash stated that he was eating his dinner when he heard a "screeching sound" which caused him to rush out of the house where he saw an aircraft flying at low level which subsequently hit trees in a wooded area and crashed.

Technical investigation following the crash failed to reveal any indication of unserviceability of the aircraft or of any malfunction of equipment either before or during the flight. Combined medical and aeromedical investigation at the crash scene established that:

a. the pilot had ejected from the aircraft before it struck the ground and probably during the period following initial impact with the top of trees and the final impact point a distance of 1700 feet (approx.);

b. the parachute had not started to deploy or had the pilot separated from the seat at the time of ground impact;

c. the pilot and seat struck the ground in an inverted position, close to the wing root of the aircraft, with the back of the seat and of the pilot in the direction of horizontal travel;

d. from the amount of brain tissue present at the point of body impact it was evident that the pilot sustained an immediate non-survivable head injury and that death probably occurred within seconds of the ground impact.

Human Factors investigation indicated that the pilot's past medical history, as shown on medical records, was non-contributory. Evidence was presented to the board that the pilot had driven, with some companions, to town at midday the day prior to the accident, a distance of 60 miles. He consumed 9 ounces of whiskey and 4 bottles of beer over a ten-hour period with last known ingestion at 2230 hours. He subsequently drove back to base, retiring to bed sometime after 2359. Two meals were eaten during this period, the last being at 1830 hours. He reported to the flights the following morning at 0730 hours, without breakfast. He ordered a flight lunch before his dual trip, but it was found unopened in the student's room after the accident. From this evidence it was obvious that the pilot had reported to the flight on the day of the accident with barely adequate rest, probably inadequate food intake, and with ingestion in excess of 12 ounces of alcohol during the previous eighteen hours.

It is worthy of note that the pilot's two companions of the previous day's activities reported sick the morning of the accident with "flu like" symptoms and were excused all duties for that day!

With this background of events the medical member of the Board of Inquiry considered it was entirely possible for the pilot to have experienced some degree of hypoglycaemia during the flight that ended with his death. Hypoglycaemia can produce decreased attentiveness and awareness, slowed reaction time and feelings of fatigue. He further stated that with regard to the possible effects of the previous day's alcohol ingestion one would expect complete metabolism of the amount of alcohol consumed by 0700 hours that morning. (A post mortem blood alcohol estimation was negative). However, the late effect of this amount of alcohol, even if completely metabolised, on a pilot's flying fitness would not dissipate so rapidly and one would expect some decrease in mental concentration, easy fatiguability, and lessening of general efficiency for some 24 hours following ingestion.

The Board of Inquiry investigating the accident subsequently found that the accident was due to pilot factor—disobedience of orders—in that he was flying at an excessively low altitude in contravention to orders and authorization. The contributing cause of the accident was assessed as carelessness in that, through inattention, the pilot allowed the aircraft to make contact with the trees. The cause of death was due to massive laceration of the brain and multiple fractures of the skull sustained on ground impact following unsuccessful ejection. The activities of the pilot during the 24 hour period prior to the accident, including alcohol intake, lack of substantial food intake for period of 18 hours and minimal rest, were considered to have contributed to the accident.

Regional Flight Surgeon's Comments

Recently there has been considerable publicity given to aircraft accidents associated with alcoholic impairment. Unfortunately there is very little information on the hangover and its relation to aircrew

performance. It is of interest to note that Harper and Albers[2] state that in a study of 158 civilian aviation accidents in 1963, in which toxological examinations were performed on the pilots involved, 56 were positive for blood and/or tissue alcohol (alcohol levels over 15 mgm/100 ml), but that flying skills are measurably decreased by one-fourth this amount.

The problem of staging when an individual may fly following consumption of alcohol and the difficulty of enforcing any rigid limitations or regulations are obvious. It is equally obvious that the "8-hour rule" takes no consideration of the late night, lack of food, and the hangover. Franks[1] referring to alcoholic hangover, states that RCAF regulations take no cognizance of the post-alcohol change which can be equally as dangerous as being under pharmacological influence of alcohol. Strickland[4] states that there is general unanimity of opinion that if an individual has consumed 4 oz of whiskey or the equivalent, a period of at least 18 hours and probably 24 hours should elapse before flying.

As education and understanding of the action and effects of alcohol appears to be the most acceptable solution for prevention of accidents as described, Unit Flight Surgeons are urged to continue to stress the dangers of flying following over indulgence, etc. Excellent articles on this subject appear in McFarland's "Human Factors in Air Transportation"[3] and in the previously mentioned references.—Aeromedical Reports 1965.

References

1. Franks, W. R. The Summation of Some Physiological Factors Leading to Incidents in the Air. In Evrard, E., et al (Ed). Medical Aspects of Flight Safety (AGARDograph 30). New York: Pergamon Press, 1959.
2. Harper, C. R. and W. R. Albers. Alcohol and General Aviation Accidents. Aerospace Med., 35: 462, May 1964.
3. McFarland, R. A. Human Factors in Air Transportation. Toronto: McGraw-Hill Book Company, Inc. 1953.
4. Strickland, B. A., in Armstrong, H. G. (Ed). Aerospace Medicine, Baltimore: The Williams & Wilkins Company, 1961.

EDITORIAL DESK

ADMINISTRATIVE COMPETENCE

In a recent letter to Commanding Officers, the Surgeon General of the Navy stated, "I look upon the use of data processing machines, particularly electronic digital computers, in our naval medical facilities as the adoption of a new, modern, efficient, and effective technical methodology."

To facilitate the adoption of this new technical methodology, the Naval School of Hospital Administration will present a new course commencing January, 1966. This course, "Basic Data Processing and Applied Statistical Methods" will introduce the students to the modern data processing systems and the statistical problems associated with the development of data processing applications.

Since the inception of advanced data processing methods in the Bureau of Medicine and Surgery some five years ago, the Naval School of Hospital Administration has had an active role in preparing Medical Service Corps officers to meet this challenge. In 1960, the course in Office Management devoted ten hours to the data processing area. Since 1960, the number of hours have increased with each academic year to twenty-five hours, or 50%, of the Office Management course in the past academic year.

In the spring of 1965, a Bureau of Medicine and Surgery and Naval School of Hospital Administration Joint Study Group recommended that the number of hours for data processing be increased to a full semester course and that the scope of the course be broadened. It was recommended that the course should also include a section on the development of applications through statistical analyses.

To fulfill the recommendations of the joint study group the course was developed in accordance with the Medical Department's needs and to satisfy the accreditation requirements of The George Washington University.

The course has been designed to assist both the data processing personnel and other interested members of the Medical Department. In order to accomplish this goal, the course will be a Survey type course and will cover the following areas:

1. Electric Accounting Machine Procedures. This section will introduce the students to all the basic machinery and procedures that can be accomplished with them.

2. Development of computers and computer applications.

3. Computer Devices. This section will include a close examination of Input, Output, Central Processing, and Control Units.

4. Electronic Data Processing Feasibility Studies. This section will discuss the requirements for a thor-

ough study of new or existing data processing units in order to justify them.

5. Applied Statistical Methods. This section will cover the necessary statistics needed to program the simple applications. Each student will develop, test and diagnose programs utilizing Fortran machine language.

The course will be taught by a member of the staff of NSHA, a Medical Service Corps officer with experience in both the field and academic areas of data processing. In addition to the regular class instruction, the course will be enhanced through the use of lecturers from the Naval Medical Data Services Center, National Naval Medical Center, Bethesda, Md. An important feature of the course is that the statistical methods section will be taught by the Director, The George Washington University Computer Center, Professor R. E. Thomas. His knowledge of both the statistical and data processing fields will be of great benefit to the students of this School.—Code 35, BuMed.

GREAT LAKES TEENAGERS JOIN THE NURSING STAFF AT THE NAVAL HOSPITAL AS "JUNIOR GLADS"

In June 1964, RADM Frank P. Kreuz, MC USN, Commanding Officer, authorized the junior volunteer program at the U.S. Naval Hospital, Great Lakes, Illinois.

Miss Melodie Mayne, age 16, daughter of Mr. and Mrs. Richard Mayne (SHC, Retired), 525 Greentree Road, Grayslake, Illinois, became the first teenager not affiliated with JANGO (Junior Army and Navy Guild Organization) to volunteer her services in the Navy Hospital. She served as a receptionist and stand-by for female patients in the Dermatology Clinic five days each week throughout the entire summer of 1964.

Soon after Miss Mayne began her work, word had spread to other high school girls about the interesting duties in the hospital. Within a few weeks, eight attractive, capable misses, aged 13 to 18, had volunteered, and served as ward clerks in dependent care units until the fall term of school commenced.

RADM Kreuz authorized the pink candy-stripe pinafore with white blouse and white shoes as their uniform.

At the close of the summer trial period of utilizing "Junior Volunteers" in the hospital as ward clerks and clinic receptionists, all reports of their work were highly favorable. A study of telephone calls received on several wards supported the surmised need for ward clerks. An average of eighty calls to a busy ward requiring a minimum of from two to three minutes to answer and provide information represents 240 minutes, or four hours of time. Without volunteers to attend the phones, receive visitors and answer their inquiries, a professional nurse, or other nursing personnel, must take time from giving or supervising patient care to provide or receive information of a non-technical nature.

With the need and value of an active volunteer service comprised of both adults and high school girls well established by our experience during the summer of 1964, it was decided that a planned program for "Junior Volunteers" who could serve as ward clerks and nursing assistants would be desirable for the summer months of 1965. RADM Kreuz heartily endorsed the idea, and the program was publicized in the station newspapers in March and April.

On 8 May 1965, 42 junior volunteers, of whom 10 JANGOS, reported for classes in duties of the nursing assistant and ward clerk. LCDR Marjorie Warren, NC USN, and LCDR Helen Parker, NC USN, Staff Education Officers, were their instructors. With four hours of instruction for ward clerks, and 32 hours of instruction for nursing assistants completed, 80 hours of supervised practice in the ward units has commenced for the nursing assistants. A capping ceremony was held in September for the young ladies in the latter group who successfully complete their 80 hours of supervised practice. Following completion of the 80 hour requirement, the volunteers may work as frequently as they desire.

As the junior volunteer group has grown, considerable discussion of an appropriate title and identification of members has ensued.

The JANGO (Junior Army and Navy Guild Organization) is a chartered organization for daughters of officers only, and not affiliated with any other volunteer group. Members pay dues, buy their own uniforms, and are awarded pins and chevrons by their organization for specified hours of service.

Since most of the junior volunteers now serving in the hospital are daughters of enlisted men, the proposal was made by Mrs. Jan Schauffler, wife of CAPT R. A. Schauffler, SC, USN, Chairman of GLADS (Great Lakes Auxiliary Dependents Service) in the Naval Hospital, that the emerging teenage, non-JANGO, volunteer group be titled "Junior GLADS," and be affiliated with the Navy Relief Society.

"GLADS" are adult volunteers associated with

the Navy Relief Society who established their auxiliary in Great Lakes Naval Hospital in 1956. The Navy Relief Society officially became the parent organization for the non-JANGO teenage volunteers on 8 July 1965, and now may award pins and chevrons to the Junior GLADS in recognition of their services. As a result, the Junior volunteers will be identified with a well-established, active volunteer service group wherever they may travel with their parents on orders.

As the shortage of nursing staff and rotation of trained personnel continues all volunteers, juniors and adults, are performing a critically needed service to staff and patients in our hospital. They promote a friendly, family relationship with hospitalized members of the Navy community while giving generously of their time, talents, and energies in both direct and indirect care of patients.

As of 1 August 1965, JUNIOR GLADS have worked an impressive total of 2812 volunteer hours.

We, at Great Lakes Naval Hospital, are indeed fortunate in having the dedicated, volunteer service organizations of "GLAD" and "JUNIOR GLADS" of the Navy Relief Society, and the JANGO, strongly supported by the Commandant, RADM Howard A. Yeager, USN, and RADM Frank P. Kreuz, Commanding Officer, U.S. Naval Hospital.—CO, U.S. Naval Hospital, Great Lakes, Illinois.

CORRESPONDENCE COURSE — "DEPENDENTS' MEDICAL CARE," NAVPERS 10510

The Medical Department correspondence course "Dependents' Medical Care," NavPers 10510, is now available for distribution to eligible regular and reserve officer and enlisted personnel of the Armed Forces. Applications for enrollment in this course should be submitted on Form NavPers 992 (with appropriate change in the "To" line), and forwarded via official channels to the Commanding Officer, U.S. Naval Medical School, National Naval Medical Center, Bethesda, Maryland 20014. Pertinent information applicable to this course is delineated below:

The course is based on regulations promulgated by the Secretary of the Navy. It emphasizes program control, concisely covering definitions, eligibility, sponsor responsibility and sources from which medical care may be obtained.

The course is covered in one objective-type assignment and is evaluated at two (2) Naval Reserve promotion and/or non-disability retirement points. These points are creditable only to personnel eligible to receive them under current directives governing retirement and/or promotion of Naval Reserve personnel."—CO, U.S. Naval Medical School, National Naval Medical Center, Bethesda, Md.

SPACE RACE

Hyatt, Abraham, *Will the USSR Reach the Moon First?* Astronautics and Aeronautics, July 1965

Many comparisons have been made of the US and Russian space programs. From Russian "firsts", it *seems* obvious to conclude that Russia is about 3½ years ahead of the US.

However, little is known as to the time initiation of the Russian space program. Their programs are announced only when they succeed, while our programs are publicized from beginning to end. The only check we have on the initiation of Russian space projects are statements by their scientists and officials. While these statements cannot be verified, it is hard to doubt their truth. The possible initiation time of a Russian manned orbital flight began soon after the 1958 Laika flight, and occurred about 3½ years later. This compares closely to our own experience, and both US and Russian programs continue to draw heavily on preceeding programs.

It has been implied that the Russian space lead is partly due to less concern than we for the safety of astronauts, but the facts do not support this. Indications are that the Russians have run more automatic in-flight checkouts of their spacecraft before their manned flights than we have.

In comparing the Manned Lunar Landing Programs, we announced our hope for a lunar landing before the end of this decade, with the earliest target date being 1967. As for the Russian Manned Lunar Landing Program, nothing is known.

Mr. Hyatt admits a lack of factual Soviet information, but concludes that the US is not as far behind Russia in manned space flights as a comparison of individual flights might indicate. Unless we have technical setbacks, we have a good chance of making the first manned lunar landing. Also, if we desire, we have a good chance to beat the Russians to a manned circumlunar flight.

Mr. Abraham Hyatt was Director of Plans and Program Evaluation for NASA.

DR. KIMELDORF CHOSEN AS ACTING HEAD OF BIO MED AT USNRDL

Dr. Donald J. Kimeldorf has been selected as Acting Head of the Biological and Medical Sciences

Division at the U.S. Naval Radiological Defense Laboratory in San Francisco for the next year, during the absence of the Head of the Division, Dr. E. L. Alpen. Dr. Alpen is at the Institute Gustav Roussy at Villejuif, France (near Paris) on a Guggenheim Foundation Fellowship. Dr. Kimeldorf will be directing 100 scientists and support personnel in a program of basic and applied research on the biological effects of ionizing and other radiations. This program encompasses the fields of biochemistry, biophysics, experimental pathology, bacteriology, pharmacology, and physiology-psychology.

Dr. Kimeldorf will continue to head the Physiology-Psychology Branch, as he has done since 1955. His detection that very low-dose ionizing radiation has an effect on the mammalian nervous system has attracted world-wide interest. Dr. Kimeldorf is also specifically concerned with long-term effects of radiation which indicate that radiation shortens life span and causes a variety of degenerative changes resembling premature aging in irradiated subjects.

On 25 August Dr. Kimeldorf leaves for Tokyo, Japan, to attend the XXIII International Congress of Physiology and present a paper entitled "The Life Span of Neutron Exposed Guinea Pigs".

While in Japan Dr. Kimeldorf has been invited to visit the University of Kyoto, University of Hiroshima, and the Japanese National Institute of Radiological Sciences.

Dr. Kimeldorf is Associate Editor of the *Journal of Radiation Research* and referees manuscripts for both *Science* and the *Journal of Gerontology*. He has published more than 100 articles and been an invited contributor of chapters for several books and encyclopedias.

In May 1965 Dr. Kimeldorf was an invited participant at the Biomedical Panel, Tripartite (USA, United Kingdom, Canada) Technical Cooperation Program held in San Francisco; an invited lecturer at the Jackson Memorial Laboratory, Bar Harbor, Maine; and at the 13th annual meeting of the Radiation Research Society held in Philadelphia, served as Chairman of the session on Radiation Effects in Nerve and Muscle, and was an invited participant in the Symposium on the Interactive Effects of Radiation and Drugs.

Prior to going to NRDL in 1948, Dr. Kimeldorf was a biology instructor at the University of Oregon for one year. He was born in Salt Lake City, Utah, and graduated from Grant High School in Portland, Ore. He earned a B.A. at Reed College in 1942; M.A. at the University of Oregon in 1944; and a Ph.D. at the University of California at Los Angeles in 1947.

Dr. Kimeldorf is married to the former Fay Tamkin from Portland, Oregon. They live at 2130 Stockbridge, Redwood City, with their three sons, Martin, 17, Howard, 15, and Lloyd, 11.